OCTOBER, 1950
Vol. 6 --- No. 5

Lubrication ENGINEERING

FORT WAYNE
INDIANA'S SECOND CITY

JOURNAL OF THE AMERICAN SOCIETY OF LUBRICATION ENGINEERS

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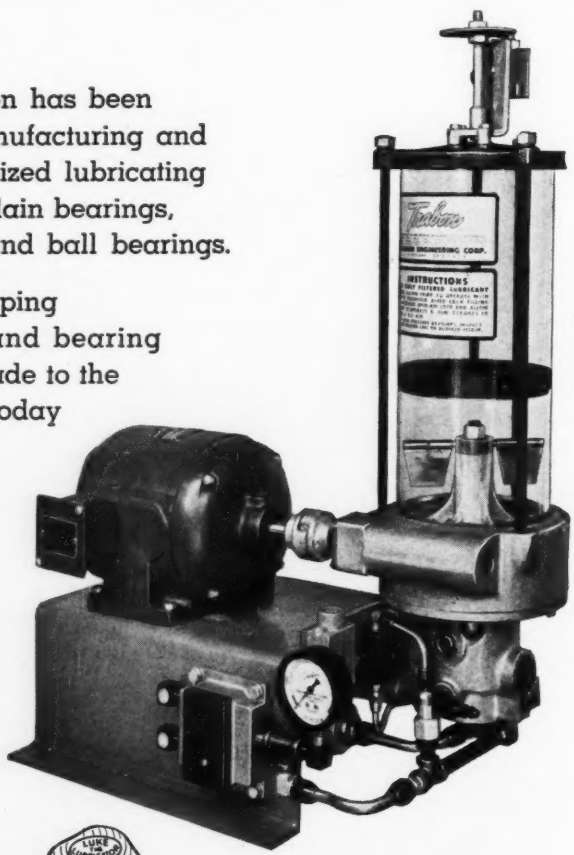

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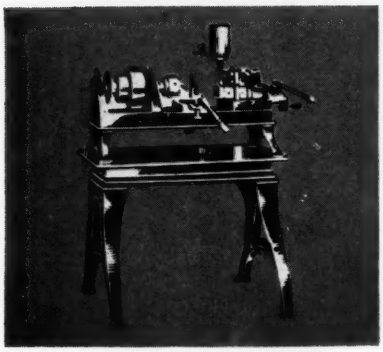
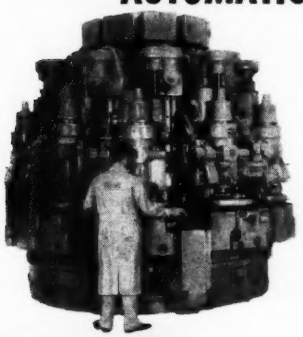


Today
AUTOMATION



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Lubrication Engineering

VOL. 6 OCTOBER, 1950 No. 5

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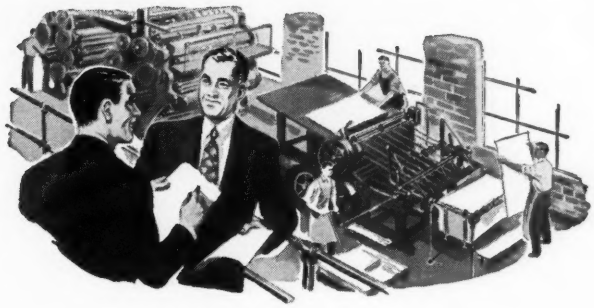

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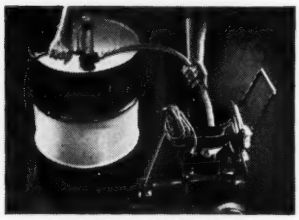

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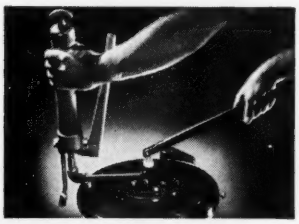

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It all started with a test on a single mammoth high speed machine, in a Chicago plant* where machine break-downs and bearing replacements were frequent, stock spoilage and rejects were high, and oil consumption ran to $5664 a year!

After a month's test of Alemite Centralized Lubrication on this one machine, the system was installed on all five other machines in the plant at a total cost of only $2471. Since that time, there has not been a single break-down or bearing loss, stock spoilage and rejects have been greatly reduced, and lubricant cost has been cut to $1417! This is an annual saving of $4247, *in addition* to more production gained from each machine, and a marked product improvement for increased customer satisfaction!

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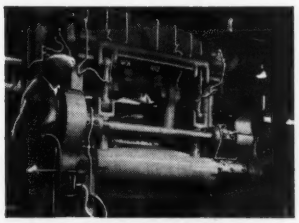

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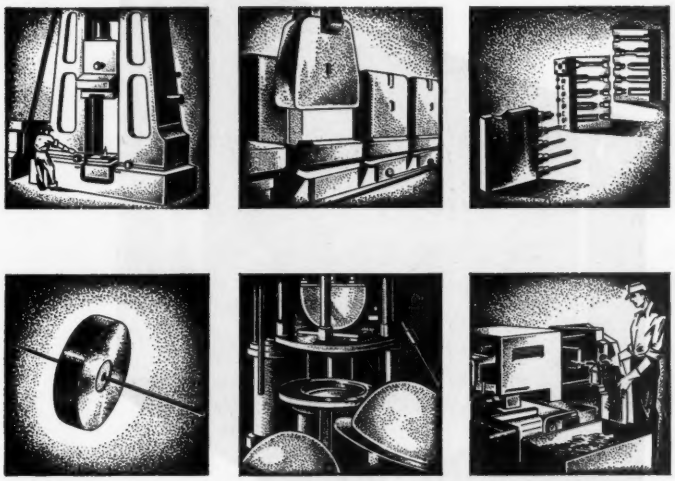

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In deep piercing you get smooth forgings, close tolerances, and reduce wear on dies. In casting and mold stripping you get smooth surfaces, clean parting, fewer rejects; and additional mold life.

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Brass, bronze, aluminum, magnesium, carbon steel and stainless steel . . . wherever your fabrication problems are friction and heat . . . **"dag"** colloidal graphite reduces the one and resists the other.

The NEW Acheson Bulletin #426 on the Use of **"dag"** Colloidal Graphite in Metal-forming Operations is just off the press . . . a copy is ready for you if you will fill in and mail the coupon.

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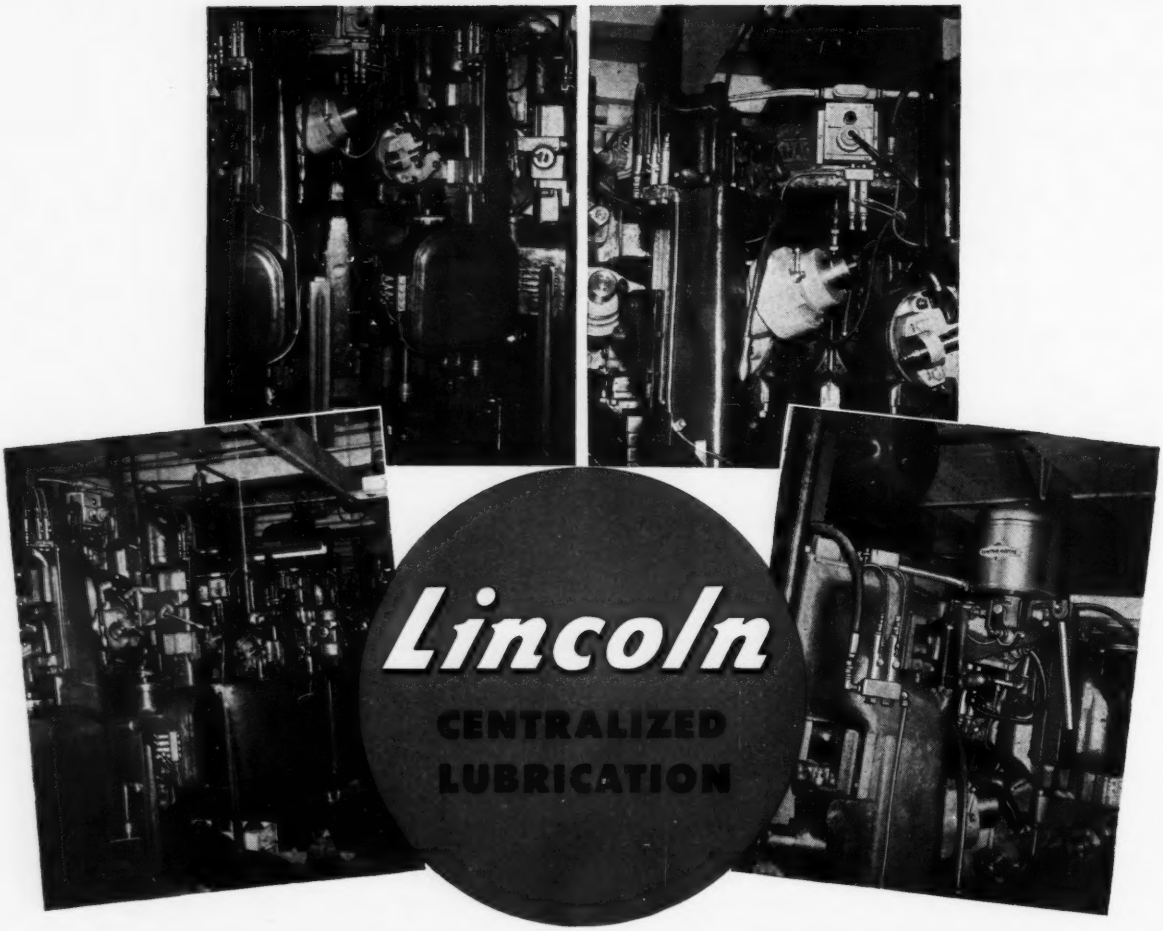

"Reduces Down-Time . . . Increases Operating Hours"

at Detroit Gear Division, Borg-Warner Corporation

The Detroit Gear Division of Borg-Warner Corporation recently completed an extensive equipment and plant remodeling program to produce a new automatic transmission for a leading automobile manufacturer.

To have a minimum amount of "down-time" and a maximum amount of "operating time", Lincoln Centro-Matic* Lubrication was installed on eight Station Cleveland Riggid Hobbers. Results were so satisfactory that the System was extended to the Bullard Production Machines. Again, the results led to the installation of the Lincoln System to a large battery of newly purchased Holcroft Heat Treating Furnaces.

According to L. A. Schnitzer, Maintenance Superintendent of Detroit Gear Division, results from Lincoln's Centralized Lubrication are:

"1. Positive automatic lubrication for all bearings at predetermined intervals

"2. Lubrication while machines are in operation

"3. Complete lubrication of machines in a matter of one or two minutes, with visual indicator at each point of lubrication

"4. Avoids costly machine breakdown time."

Lincoln's lubrication system specialists will work with you and recommend the time and money saving Centralized Lubrication System best suited to your equipment.

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LINCOLN ENGINEERING COMPANY, 5743 Natural Bridge Ave., St. Louis 20, Mo.

SUNOCO WAY LUBRICANT
Chosen Over All Others For
WORLD'S LARGEST MILLING MACHINE

The milling machine shown below—the largest in the world, according to its builder—will soon be producing main spars for turbojet planes. The length of the ways and the weight of the table of this mammoth precision-built machine tool make its lubrication a real problem. To hold tolerances and avoid enormous refinishing expenses, the oil must support the table evenly and lubricate the ways perfectly.

To meet such requirements, the way lubricant must combine many qualities. It must be an oil with extreme pressure characteristics, metalwetting capacity, and adhesiveness, so as not to squeeze out under heavy loads; it must flow freely, prevent "stick-slip action" of the table, and successfully resist rusting.

An oil that can meet all those requirements is exceptional. So it is significant that after extensive comparative tests the machine tool builder selected Sunoco Way Lubricant and recommends its exclusive use on the ways of this costly miller. He knows this "Job Proved" Sun product protects his reputation as well as the big investment in time, money, designing skills, craftsmanship.

SUN OIL COMPANY • *Philadelphia 3, Pa.*
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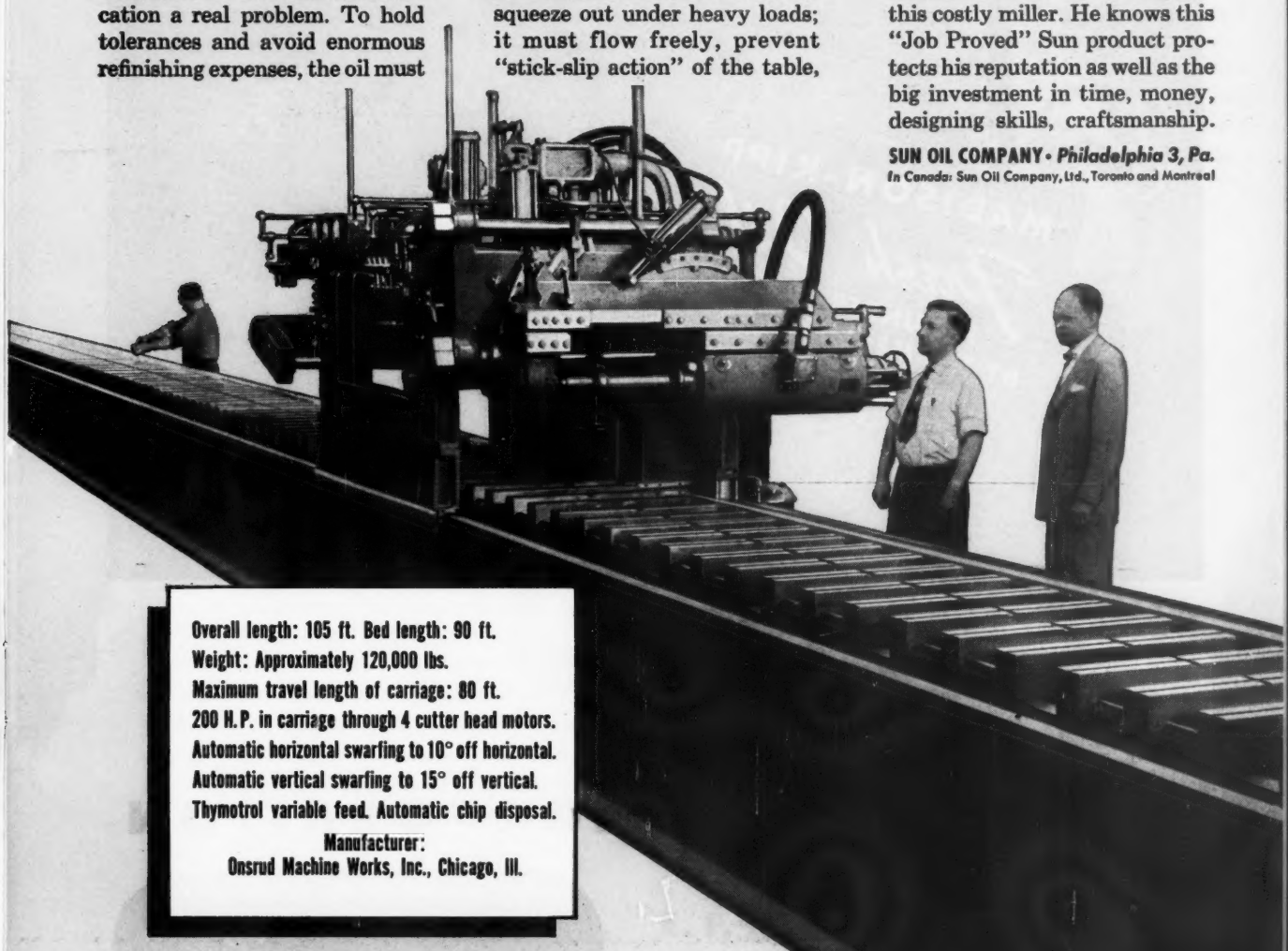

Overall length: 105 ft. Bed length: 90 ft.
Weight: Approximately 120,000 lbs.
Maximum travel length of carriage: 80 ft.
200 H.P. in carriage through 4 cutter head motors.
Automatic horizontal swarfing to 10° off horizontal.
Automatic vertical swarfing to 15° off vertical.
Thymotrol variable feed. Automatic chip disposal.

Manufacturer:
Onsrud Machine Works, Inc., Chicago, Ill.

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The HOUGHTON LINE NEWS

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Circulation 198,000

...the "near editor's" viewpoint

Russians claim invention of Scotch whisky, but switched to manufacturing vodka after the Scots produced an admirable imitation.

It is certainly worthwhile to get together with your competitors once in a while and discover that some of them have more troubles than you do.

One way to help overcome the postal deficit is to reduce congressional franking privileges. Very seldom is the stuff they send out of any real importance.

A summer resort is where the natives live on your vacation money all winter.

Aaron E. Carpenter

CHAIRMAN OF THE BOARD.

Not every machine can have talent such as this administering to its well-being. But every machine *can* have Hydro-Drive Hydraulic Oil and Houghton's lubricants for headstocks, ways and slides. They'll make machines happy and care-free, too.

For Lubricating Open Gears

Here's an answer to the problem of what grease to use on open gears. It's Sta-Put 567, a semi-fluid limebase grease, having high adhesiveness. Gears should be well cleaned before applying. After brushing or swabbing on, it should stand for half an hour to permit solvent content to evaporate. This will leave a rather hard drying film which will not peel at low temperatures. This film resists water or acid, and will not pick up dirt like a soft grease would. Ask the Houghton Man.

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Every shop man knows how hard it is to remove oxidized oil and contaminants from machines or parts. Binding sludges or gums are easily cleaned from gears or metal surfaces by soaking them in Houghton's Gum Solvent "B"—a handy material to have around the shop.

For cleaning hydraulic systems, 5% of Gum Solvent "B" may be added to the oil to take gums into solution, and the machine run in actual production for 100 hours, then the reservoir dumped. It works while the machine works! Have your storeroom order a drum.

How H.E.L.P.* can give you simplified lube control

Long study has resulted in a method which further simplifies plant control of lubrication practices. We call it *H*oughton's *E*ngineered *L*ubrication *P*lan.

As it is being applied today in a wide variety of plants this plan calls for the following:

(1) A check to be made of the plant's machines requiring scheduled lubrication, with each machine listed in a report supplied to the plant officials.

(2) Cards and celluloid holders supplied for each machine, easily visible for lubrication reference — *what* oil, *when* and *where*.

(3) A duplicate set of cards, one for each machine, filed in a handy file case, according to date of next lube application prescribed.

This permanent record becomes the control station, or nerve center, of the entire simplified plan. It can be readily followed when installed correctly at the outset. And the Houghton lubrication technician who checks the job in advance and recommends the best "fortified" lubricants will make sure that the set-up is right for future handling.

This "H.E.L.P." aid is offered on the basis that a firm desires to have us study its lubrication procedure and simplify it, both from the standpoint of control and the ability to do a better oiling job with fewer varieties of oil and grease.

If that appeals to you, we would be glad to have the Houghton Man make a preliminary check, with no obligation.

*Houghton's Engineered Lubrication Plan.

Free folders you may need:

1 ***Hydro-Drive Hydraulic Oil*** — technical folder covering hydraulic oil problems and solutions.

2 ***Houghton's Grease Booklet*** — describing our complete line of solid lubricants.

3 ***All-Star Line-Up of Rust Preventives*** — the Rust Veto series for industry.

4 ***Hi-Temp Oils*** — for safe, efficient lubrication at temperatures up to 500° F.

Write for any or all of these.

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1951

CONVENTION HI-LITES

WHAT PLANNED LUBRICATION MEANS TO MANAGEMENT

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Factual Information Will Be Given On:

★ HOW TO GET MORE DOLLAR VALUE OUT OF LUBRICANTS

★ FACTORS TO CONSIDER IN PURCHASING LUBRICANTS

★ THE FUNCTION OF STAFF LUBRICATION ENGINEERS

★ IMPORTANCE OF CENTRALIZING LUBRICATING ACTIVITIES

★ FIRE INSURANCE PREMIUMS VS. PLANNED LUBRICATION

★ SAVING MONEY BY PROPER HANDLING OF LUBRICANTS

HERE IS THE PROGRAM IN FULL FOR THE SESSION

WHAT LUBRICATION MEANS TO MANAGEMENT

by W. L. Lewis, *Vice President*
International Business Machines Corporation
Endicott, New York

Mr. Lewis, who started in IBM as a bench worker, progressed through various positions in the Manufacturing and Engineering Divisions until in 1942 he was made Factory Superintendent at the Endicott IBM Plant. In 1946 he became General Superintendent of all IBM plants and in 1949 he was elected Vice President.

Mr. Lewis' activities are not confined to IBM. He is a director of three associations including one bank; he is a member of two honorary engineering fraternities, has judged several contests on better advertising copy and improved product designs, and is a member of many organizations connected with philanthropic and National Security activities.

Here is a man with broad experience in lubrication who knows its relation to production. This knowledge plus that gained from numerous related activities places him in the enviable position of being able to properly evaluate the importance of planned lubrication. Every person from top management down will be interested in what Mr. Lewis has to say on this vital and timely subject.

EFFECTIVE LUBRICATION AS A FIRE PREVENTIVE

by R. G. Shepherd, *Engineer*
Standards Department, Factory Mutual Engineering Division
Boston, Massachusetts

Mr. Shepherd is an outstanding author and speaker on the subject of the relation of proper lubrication as a preventive in the occurrence of fires. Although most of Mr. Shepherd's work has centered around the textile industry, his paper will be applicable to industry as a whole.

STORAGE AND HANDLING OF LUBRICANTS

by O. M. Albl, *Lubrication Engineer*
Thompson Products Company
Cleveland, Ohio

Too often lubricants are contaminated during storage or in application to equipment with resultant costly repair bills. Contaminants in lubricants can do untold damage to precision machines and there is little excuse for loss of labor and down time resulting from such causes.

Mr. Albl is an outstanding lubrication engineer in a progressive company which has demonstrated the value of planned lubrication. He has had many years of experience in this field and knows the means and value of saving dollars through the proper storage and handling of lubricants.

PLAN NOW TO ATTEND
THE 1951 ASLE NATIONAL CONVENTION
TO BE HELD AT
THE BELLEVUE-STRATFORD HOTEL IN PHILADELPHIA
APRIL 16, 17 AND 18

Lube Lines

Oil Reclaiming

The Oil Reclaiming Symposium held at the Detroit Convention last April created widespread interest. This controversial subject was ably covered by representatives of consumer industries, oil suppliers and equipment manufacturers.

In view of the many letters received at the National office requesting further information on this topic, we are publishing the full text of papers and discussions essentially as they were presented at the meeting. The wide range of the views expressed indicates the extent of thought that is centered on this phase of the lubrication problem.

The ideas expressed are not necessarily the opinions held by the Society as a whole, but they serve to show the varied aspects of the subject.

The JOURNAL is indebted to Mr. Henry Muller of the Shell Oil Company for his efforts in arranging and organizing this program on oil reclaiming.

Page 208

Organized Lubrication

At the request of a number of our members we are publishing a paper, in the form of a series of connected notes culled from the GM Corporation Shop Lubrication Committee Meeting records. This corporation has for many years handled its general shop lubrication problems by the committee system, wherein a combination of ideas and opinions are brought to a common meeting ground for discussion.

By this method it has been found that a wealth of departmental practices can be brought together periodically for weighing and sifting. From these proceedings have emerged the present plans for the selection and application of lubricants.

It was felt that interest and benefit would accrue if the findings, resulting from these meetings were compiled and presented in a form suitable for publication.

We are indebted to Mr. L. A. Danse, Supervisor Materials and Processes, Production Engineering Section of General Motors, for his efforts in the compilation of the subject material appearing in this issue.

Page 206

Educational Series

The December issue of LUBRICATION ENGINEERING will present the first of a series of articles on LUBRICATION which will embrace the following subjects: REFINING, DISPENSING EQUIPMENT, SPINDLE OILS (METAL WORKING TOOLS, TEXTILE MACHINERY), HYDRAULIC OILS, GEAR OILS, GREASES, COMPRESSOR and TURBINE OILS, REFRIGERATING OILS and RECLAIMING OF OILS.

The services of noted authorities in their respective fields have been enlisted for this project.

The articles will be so arranged that they may be clipped intact, thus constituting a valuable reference file that will assist in solving shop problems and the proper selection and application of lubricants. It should also prove invaluable in the training of industrial lubrication engineers.

The series is sponsored by the A.S.L.E. Committee on Lubrication Economics under the able Chairmanship of Mr. Frank Ross of E. F. Houghton & Co. This group is one of a number of committees formed to gather informative data for publication, thereby rendering additional service to our readers.

On request, subjects not included in the above outline will be covered through these columns or by direct correspondence. Inquiries should be directed to the Editorial Offices, 343 S. Dearborn St., Chicago 4.

Mr. C. M. Larson, Chief Consulting Engineer, Sinclair Refining Co., New York City, inaugurates the series in December with his article on *Refining*.

Lubrication "Know-How"

In a letter to the editors, Mr. R. C. Garretson, Tool Development Engineer, International Harvester Co., Evansville Works, Evansville, Indiana, writes of a lubrication problem in his plant and how it was solved. We are passing it on to our readers believing it will prove of interest.

"In our plant we have many air line lubricators which are mounted in overhead locations, impossible to reach without the use of a ladder. Since this is dangerous and time consuming, and often interferes with production, we were anxious to relocate the lubricators. This proved to be impractical, so we solved our problem in another way. The filler plugs were removed from the lubricators and replaced with tube connections. Copper tubing was then run to a convenient location at floor level, and a pin type grease fitting installed at the end. To reduce the possibility of leaks, a check valve was installed just ahead of the fitting. Now an ordinary lever type grease gun is used to force oil into the lubricator."

ORGANIZED LUBRICATION IN A MANUFACTURING PLANT

by L. A. Danse
Supervisor Materials and Processes
Production Engineering Section
General Motors Corp.
Detroit, Mich.

Mr. Danse, prior to his affiliation with the General Motors Corporation, served the field of lubrication through his association with the Atlas Engine Works, Dayton Engineering Labs., Diamond Chain Co., Lincoln Motor Co., and the Cadillac Motor Car Div.

Mr. Danse is a member of the S.A.E., A.S.T.M., A.S.L.E. (Former Director), S.N.T., the Michigan Sewage Works Association and others. He holds important positions in these societies.

"Way Back When" *

The Need

Repeatedly we have heard, at local section meetings, at national conventions, and at meetings of other technical societies, lectures or papers which dilate on the fact that in preventive maintenance, as nowhere else, the old saying is true that an ounce of prophylaxis is worth a pound of cure; and that there is no phase of preventive maintenance so important as lubrication on a planned, organized and scheduled basis.

Fundamentals

Almost all movement involves friction; and the minimization of friction decreases the energy required to cause movement. Likewise, in those members of moving machinery, which carry the loads, reduction of friction connotes greater efficiency and longer service life. So that, from the design engineer to the production operator, everyone knows that the ne plus ultra of service life is proper lubrication and without it, operating efficiency and service life suffer.

Granting then, that following competent design, proper materials, and adequate workmanship, in the construction of machinery, the most potent factor in maintaining effective operation is correct lubrication; it behooves us to so arrange the lubrication of the plant machinery that we will have maximum production efficiency and minimum down time.

This involves the presumption that the choice of the plant machinery was, at least in part, premised upon assurance of adequate engineering design of bearings and lubricating systems. Where this cannot be, or has not been done, the lubrication engineer's problem is complicated.

Scope

Modern production plant layouts are largely based upon material handling considerations and the layouts are made to promote the progress of the parts and components through the series of fabricating and assembling operations and processes with the least possible effort in handling. So nowadays we have not only the machinery essential to fabricating, but additional machinery which does the handling and the carrying of the parts between operations and processes.

Planning

Thus, the first task of the lubrication engineer is to list and locate the machines; after which he must study their various bearing and wearing part constructions and classify the lubrication and lubricant needs. This is the key to the whole organization of lubrication and, in fact, of preventive maintenance; for the reason that upon this analysis of the equipment and its needs, will depend the choice and listing of lubricants and the scheduling of lubrication intervals and lubricant quan-

*Mr. Danse, in response to our request for his personal background, gave us the following report, which we print verbatim.
Various occupational engagements experienced include:—"Riding water" on a cattle ranch, to dudes this means policing and repairing windmills and pumps, some of them the gas or electric type, as well as wind;—Mining, where the equipment is subject to extremely rigorous service;—Railroading in the southwest where desert sand storms and mountain snows make lubrication a precarious venture;—Some work with boats and shipping, where frequently lubrication was done by fearful and wonderful means;—Desert and mountain freighting with teams ranging from two donkeys to a dozen or sixteen mules and where regular greasing of the wagons made considerable difference in the relative safety of the journey;—Topped off with 35 years experience in industry where lubrication problems covered everything from instruments to extreme high speed machines or equipment of extremely heavy weight.

tities. And, in turn, upon this depends the success of the whole undertaking.

Machine Records

Most high production plants have each piece of machinery and equipment numbered and listed. Using this list and these numbers, the lubrication engineer makes out his machine cards or slips, upon which he notes the types, sizes and characters of the machines or equipment and then enters the locations of the machines and the kinds of lubricants, positions of lubrication points, frequency and amounts of lubricants to be applied; and adds any comments as to special nature of work, or particular attention required. Sometimes it is advantageous to include comments on repairs or servicing necessary; as in this way it can be determined whether a machine is overloaded, abused, or just plain inadequate. From these comments it is possible to ascertain whether equipment is economical or costs too much to keep going. This enables better choice of machinery when making replacements or procuring additional equipment.

Lubrication Service Cards

From this master list, the lubrication engineer makes out machine servicing cards for the lubrication service men to use in routing and scheduling their work; and, as the work is done and the machines serviced, the service men check off each machine as having been completed. It is well to have such check-offs dated, and sometimes, on machines subjected to severe operating conditions, even the time of day entered. By thus requiring the lubrication service man to check off his own work and initial each check-off, he is kept aware of his responsibility for the good condition of the equipment. In this way, he acquires an interest in his functions which leads him to more closely observe the operation of the equipment and often to note unusual conditions and give forewarning of possible trouble.

Lubrication Service People

Because of this responsibility and its potent effect upon operating efficiency, the choice of, and also the training of the lubrication service men should be done with great care and consideration. It is advantageous to select lubrication service men as an upgrading from machine repair men, or millwrights; as these service men are the key to long service life and without their care and interest, machine repair intervals are short and costs high.

Their Importance

Lubrication service men are the shop equipment police officers and they maintain order in the plant; so pick them with particular pains to insure their fitness, just as you hope your city does with the police force which maintains order in your home town.

Shop Lubrication Committee

In preparing the master lists and the machine lubrication service cards, the lubrication engineer will do well to set up a shop lubrication committee to work with him and share his responsibility for the proper planning and administration of shop lubrication functions. Naturally the lubrication engineer is the executive officer, who exercises general supervision; just as the lubrication service men are the policemen of the equipment. However, a shop lubrication committee can be of great assistance to the lubrication engineer and can help him over many rough stretches of shop service.

Its Makeup

An effective arrangement for a shop lubrication committee would be to have the machine repair supervisor, the purchasing agent who buys the lubricants, the laboratory man who tests them, a production shop supervisor, and the work standards man who time studies the shop jobs, all join with the lubrication engineer to study the plant needs and establish basic requirements. Far from detracting from the lubrication engineer's prestige and standing, such a committee will do more to promote efficient practices than any other means could possibly do. Their advice, support and interest will provide assurance against opposition or lack of appreciation from the shop staff and hands. Such a committee will give management the most for its money, the lubrication engineer a much easier task, and the operating people a guarantee of the unbiased attitude which affords freedom from trouble. Such a set-up inspires more confidence than can any individual, alone, no matter how talented.

Choice of Lubricants

The choice of lubricants to be used is one chore which will devolve upon the lubrication engineer; but here again the shop lubrication committee can be of inestimable value by helping plan and supervise service tests of lubricants to determine their fitness. Performance or operating tests can be far better handled by a committee than by an individual, as the group is less likely to be accused of partiality and is also less likely to fail to observe any irregularity during testing. Even where highly trained test and tryout people are available to run tests, the tests will usually be better conducted under the interested scrutiny of the varied skills and viewpoints of a shop lubrication committee made up as above suggested.

Service Suitability

Lubricants chosen should be picked for their fitness for the work, their availability and their economy. Never select lubricants on the basis of cost. Always consider the character of the suppliers, as an unscrupulous or irresponsible supplier will jeopardize the whole program. Have no friends to reward nor enemies to punish; do not go upon opinions, but ascertain the facts. This approach will facilitate proper selections.

Trade Brand vs. Specification

The argument between the proponents of trade brands and those who favor specifications waxes strong. Where the plant is small, there is much in favor of procurement by trade brands. But, even then, it is well to try several reputable producers' products in comparison; and thereby determine whether one or another brand is priced out of line.

Judgment

Where the plant is larger, and the equipment, knowledge and skills are available, there is advantage in controlling procurement by properly formulated specifications. Here, the lubrication engineer assumes some of the responsibility for the materials, which, when procuring on trade brands, is carried only by the suppliers. In this case, the lubrication engineer has to remember that the suppliers are possessed of knowledge,

(*Continued on page* 238)

OIL RECLAIMING SYMPOSIUM *

RECLAMATION OF INDUSTRIAL PETROLEUM PRODUCTS

by Dean M. Cleaveland
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Mr. Cleaveland received his B.S. Degree in Chemical Engineering from the Ohio State University. After several years with companies such as Pure Oil and Continental Oil, he affiliated with Bendix Products Division of Bendix Aviation Corporation. He is Lubrication Engineer in charge of procurement, storage, distribution, and reclaiming of liquids. He has served in this capacity since 1940.

The word "reclamation" as applied to processing industrial petroleum products is not always the most satisfactory word to use. There are many, including the writer, who feel that this word connotes the idea that the products are merely cleaned up slightly. The objective of such processes, however, is to completely restore petroleum products to their original quality and usefulness.

There is a word which seems to present a more accurate description of the processing of these materials as practiced at the Bendix Products Division of the Bendix Aviation Corporation. That word is "Salvage." The dictionary defines "Salvage" as "that which is saved from destruction * * * as valuable or having further usefulness."

In the Bendix plant the process is truly a petroleum salvaging operation. The products are processed to restore their original quality, which otherwise would have been lost because of contamination, and are restored completely to further usefulness for manufacturing departments.

One might justifiably question why industrial petroleum products should be salvaged when their cost is so low. Although their unit cost is low, in many shops the volume of usage is such that their salvage is an important economic factor in shop operation. It is not meant to imply that a shop will necessarily need to salvage its used industrial petroleum products, but it is obvious that when the salvaging of these products can mean a net saving of $10,000 or more per month in a plant employing approximately 8,000, it is not only economically desirable but also an economic necessity.

In addition to reducing operating costs, salvaging of oils is of value in at least two additional respects. First, this practice will aid in conserving one of our most valuable natural resources. Second, by constant or periodic processing of cutting oils, in particular, oil poisoning or dermatitis among operating personnel can be greatly reduced.

In approaching the problem of salvaging industrial petroleum products for any plant or shop, it is recommended that someone in the operating organization having a good general knowledge of plant problems and processes be assigned to make a careful survey of the entire plant. This survey is designed to determine just what petroleum products can be salvaged economically and to what extent or degree it would be desirable. In making a survey of this kind and in subsequent selection of equipment, it should be borne in mind that the processing should be as simple as possible. The problem of salvaging industrial petroleum products is a complex one. What will work for one plant may not serve well in another. Therefore, it is impossible to make universally applicable recommendations for salvaging procedures.

The contaminants which cause industrial petroleum products to lose their usefulness and the methods of restoring them to further usefulness can be roughly classified into four categories. Each of these is discussed briefly below:

1. *Insoluble materials having particles larger than colloidal dimensions.* Included are metal particles, lead deposits in fuels, dust, water and some oxidation products. This type of contamination is removed by filtration, by settling or by centrifuging, depending upon the degree of purity needed to restore the oil, solvent, or fuel to its original quality. For example, in the salvaging of cutting oils two types of filters are used at our plant. These are the so-called capillary filters and the frequently used pressure filters. A typical capillary filtering reservoir equipped with a steam coil is shown in Fig. 1.

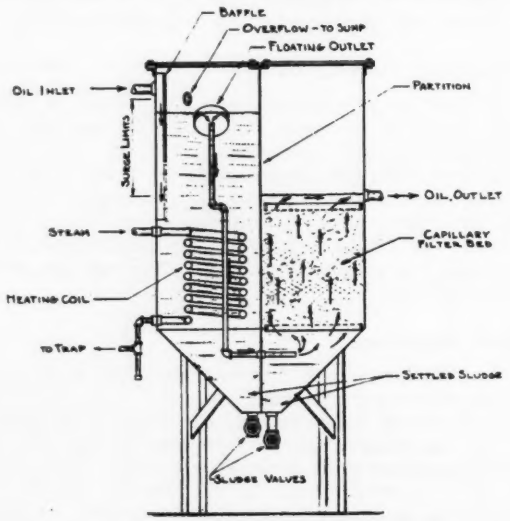

Fig. 1
Sterilizing and filtering unit.

In this reservoir the dirty cutting oil comes to rest and the temperature is so controlled that the bacterial contamination is elimiated and most of the sludge and dirt is allowed to settle. Separated sludge and dirt are drawn off periodically from the bottom. The practically clean oil is drawn from the top of the reservoir after filtering through a capillary filter bed of cotton waste, horse

* Papers presented at 5th Annual Convention of A.S.L.E., Detroit, April 11, 1950. (See "Lube Lines" for comments.)

hair, or similar material. The clean oil is drained into a storage tank.

There are several modifications of this capillary type of filter, depending on the volume of cutting oil to be handled. For dark cutting oils such equipment has proved quite satisfactory, its operation is practically automatic, and but little maintenance is needed.

Using a pressure filter, the dirty oil is first pumped into a settling tank. There it remains long enough to drop part of the dirt and sludge. From the settling tank it passes to a sterilizer where it is brought up to sterilizing temperature. It is pumped through the pressure filter after which the clarified oil is collected in a clean oil storage tank ready for re-use.

There are several types of pressure filters, the principles of which are much the same. A typical one consists of a cylinder with a removable head and a clean-out hole at the bottom. An inlet opening admits dirty oil into the cylinder. Grids are mounted vertically in ports on an outlet manifold. These grids are covered with canvas bags, and each grid and bag is held in place by separators. A diatomaceous earth is mixed with the dirty oil, and the mixture is pumped through the inlet port into the filter. The diatomaceous earth forms a cake on the filter bags and prevents them from becoming clogged. The fineness of the earth also determines the degree of filtration. The dirt collects on the earth cake. The clear oil follows the grid down into the outlet manifold, and out of the filter into the clean-oil storage tank.

The efficiency of this filter decreases rapidly above 45 psi pressure. Therefore, at this pressure the flow is reversed, expanding the bags and causing the earth cake and dirt to fall to the bottom of the tank. A new earth cake is then deposited on the bags and the filter is ready to function again. This particular type filter has been very satisfactory for clear cutting oils where a greater degree of clarification is desired than it is possible to obtain with the capillary type filter.

2. *Volatile impurities.* Included in this category are mixtures of oil and solvents or fuels. Here salvaging is a matter of separating two liquids. In our particular case we have mixtures of cutting oil and Stoddard solvent or of motor oil and an unleaded fuel. The basic method of salvaging these materials is the same, namely:

a. A rest period in a settling tank.
b. Vacuum distillation, using live steam to prevent cracking.
c. Passing the condensed fuel or solvent to clean storage.
d. Drawing off the still bottoms (cutting oil or motor oil) into a residue tank.
e. Circulating the hot motor oil through a Fuller's earth filter until original neutralization number and physical properties are attained or, in the case of a cutting oil, pressure filtering and returning to a clean-oil storage.

This process can be carried out in a vacuum still. A typical vacuum-still, which is semi-continuous in operation, is shown in Fig. 2. The vacuum pump (Q) is on the discharge side of condenser (J) and the heat energy is furnished by means of calandria unit (C). The mixture of oil and solvent or fuel is drawn into the still by vacuum through level regulator (L), heat exchanger (G), and feed pipe (F) into the vaporizing chamber (D). The light material is vaporized and passed into the dome over the heat exchanger into the condenser through the vacuum pump and into moisture filter (O) to storage. The cutting oil or motor oil finally builds up in the still to such an extent that the level regulator shuts

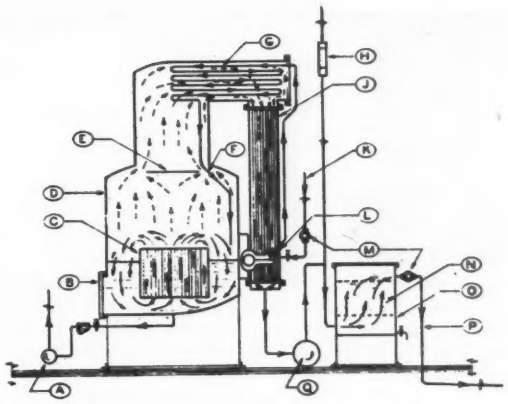

Fig. 2

Vacuum still.

** KEY **

A-Hot Residue Pump	J -Condensor
B -Access Port	K -Dirty Solvent Line
C-Steam Calandria Unit	L -Solvent Feed Regulator
D-Vaporizing Chamber	M-Sight-Flows
E -Vapor Baffle	N-Moisture Absorption Bed
F -Feed Pipe	O-Moisture Filter
G-Heat Exchanger	P -Distilled Solvent Line
H-Vacuum Pump Vent Baffle	Q-Wet Vacuum Pump

off the feed of the mixture to the still. At this point the still is shut down, vacuum is released, and the residue pumped from the still for further purification.

3. *Colloidally dispersed insoluble particles.* Included in this group are sludges formed by oxidation, certain types of fuel soot, emulsions, etc.

4. *Substances soluble in oil and having comparable vapor pressures.* Included in this group are oxidation products such as acids, aldehydes, ketones and polymers thereof.

The last two classifications of impurities can be removed by such methods as settling, distillation or fractionation, absorption, adsorption, neutralization, coagulation, and in the case of 3, by filtration. There are also re-refining processes which change the quality of the used oil to that of the original by removing all the impurities listed under the four classifications. No attempt will be made to describe these processes since they deserve specific and detailed attention. They are not utilized in operations at our plant.

In conclusion, the following thought should be emphasized. Industrial oil salvaging in most shops can be done profitably, providing the process is both simple and effective. Otherwise, results of salvaging projects will be disappointing. In many plants costly salvaging equipment is frequently laid aside, simply because the process turned out to be too complicated to utilize economically.

RECLAIMING OF USED LUBRICATING OIL

by A. R. Black
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Mr. Black is Industrial Applications Engineer of Shell Oil Company. He received his M. E. Degree from the Stevens Institute of Technology. He has spent twenty-five years in engineering development work in the petroleum and associated industries. During the war, Mr. Black was attached to the Research and Development Division, Office Chief of Ordnance, as Consultant on Fuels and Lubricants.

A. R. BLACK

Generally speaking, the reclaiming of used material or equipment is invariably attractive at the first glance but as the various aspects are studied and evaluated, the total costs mount and the relative attractiveness diminishes.

During the housing scarcity many of us, along with the well-known Mr. Blandings, stumbled into the snare of the charming old Colonial ruin that required only a skillful reclaiming job to make it a habitable "dream house." We learned to our sorrow that there were many "hidden costs" that were not covered by the original estimate.

In considering oil reclamation we will find that there are many "hidden costs" which must be added to the actual labor and material costs, usually quoted, if we are to get a true picture. To mention a few, there are handling and shipping costs, pick-up costs, transshipment and reconditioning of containers. Add to these the costs involved in accumulating experience. Experience is required to refine and finish good lubricants and experience is required to reclaim them properly after use. Then, too, there is the cost of building, maintaining and operating a control laboratory. Control costs do not scale down as a straight line function of capacity but militate against the small volume operation. We must, therefore, accept relatively high control costs as an integral part of the cost of reclamation. The unhappy alternative is to relax controls in order to reduce operating costs and, in this way, sacrifice quality of the reclaimed material.

A factor which complicates the reclaiming picture is the variable nature of the charging stock. In the refinery the number of charging stocks is kept to a minimum. Precise procedures are worked out for any given charging stock and the control factor remains unaltered while the charging stock is the same and the finished product is, as a result, uniform in properties and quality.

Used oil, on the other hand, provides a constantly varying charging stock which multiplies the control problem many fold if a uniform product is to be produced. The alternative here is to accumulate in large storage tanks sufficient used oil to supply a fairly uniform charging stock for several months of continuous operation. This method reduces control costs but increases tankage requirements and handling costs.

So far nothing has been said of the problems involved in attempting to reclaim inhibited-type lubricating oils, modern oils with special properties which are imparted to selected base stocks by means of suitable inhibitors. Now, not all stocks are susceptible to inhibition. Stocks which lack susceptibility are not improved to the desired degree by the addition of the inhibitors. In the refinery stocks are selected and refined with the view of enhancing inhibitor susceptibility. The character and degree of refinement required to arrive at a given level of susceptibility depends upon the nature of the starting stock.

Oxidation of an inhibited oil in use results in the gradual attrition of the additive. Even in the case of straight mineral oils, the natural inhibitors are similarly expended through use. The reclaiming procedure should reestablish the original level of inhibitor susceptibility and then a suitable quantity of the proper inhibitor should be added in order to arrive at some semblance of the original oil quality.

When all these factors are taken into consideration, we find that the reclaiming of used oils is far from being the simple procedure that we had hoped.

One may have been attracted to reclaiming by the hope of reducing lubricant costs, a desirable goal if quality is not sacrificed. In a broader economic sense, however, the true criterion is not the "cost of lubricant" but the "cost of lubrication." If a thorough consideration of all of the hidden costs in oil reclamation leaves us with some misgiving as to whether or not there will be a net saving, it is in order to recommend some other ways of reducing "cost of lubrication," ways which may prove more readily adaptable to your particular needs than is reclaiming. Here are a few suggestions:

a. Extending the useful life of the new oil by maintaining the condition of equipment and by carefully controlled operating practice. Contamination and improper operating temperatures are two of the most prolific contributors to oil deterioration.
b. Use of inhibited oils and adequate maintenance of their condition in service. These modern turbine, hydraulic and circulating oils have many times the efficiency of the older oils and pay their own way in reduced "lubrication costs" and extended life of the equipment which they lubricate.
c. The application of a recently developed lubrication program which employs a heavy-duty-type oil as original charge and for make-up, a supplementary replenishing oil with higher than normal additive content, carefully balanced to maintain the desired level of concentration. Where conditions warrant, continuous filtration may be combined with this program to advantage.
d. The use of premium-type multipurpose lubricants which are applicable to a number of lubrication jobs. Such lubricants aid in reducing inventories. The simplification which they introduce into your lubrication program reduces the danger of misapplication. All these factors point in the direction of improved "economics of lubrication." Today much research is being done to find ways of incorporating in one lubricant those properties which will make it a good lubricant for a number of different applications.

The foregoing are just a few of the ways which might be suggested to help reduce "lubrication costs." This may seem to be somewhat removed from the subject, but we are dealing with a subject which leads us directly to a consideration of economics and oil reclaiming is of interest to the consumer only if the over-all economics are favorable.

RECLAIMING INDUSTRIAL PETROLEUM PRODUCTS

by R. W. Goodale
Standard Oil Co. of Calif.
San Francisco, Calif.

Mr. Goodale graduated from Oregon State College in 1929 with an Engineering Degree. He has been affiliated with the oil industry for 21 years. He is now manager of Lubricating Oil and Grease Sales for the Standard Oil Company of California, after having served in the Producing, Research and Product Acceptance Departments.

R. W. GOODALE

Any presentation or discussion on this subject might briefly be highlighted as follows:

1. Reclaiming or purification of a lubricant to protect the mechanism being lubricated.

2. To protect the petroleum supplier of the virgin lubricant.

3. To protect the user of petroleum products against unnecessary shutdowns, and in turn protect supplier of equipment and increase production.

These three fundamentals are of basic importance as we are vitally interested in furthering our own knowledge of reclaiming lubricants. With unity between the petroleum industry, the manufacturer of production equipment, and the manufacturer of reclaiming equipment, all are benefited when the problem is more clearly understood. The user of petroleum products is concerned primarily with the saving of dollars, provided it is economical to do so by reclaiming.

The three points mentioned above have many subdivisions and as many different approaches to their solution. In endeavoring to correlate these points, the vast amount of conflicting information on the subject is ever present.

The expression "peace, but not peace at any price" could be paraphrased "oil cleanliness, but not at any price." Another three points can be raised:

1. Does the equipment involved warrant the price of reclaiming lubricant?

2. Does the price of the lubricant, when reasonable drain and change periods are standard practice, outweigh filtration?

3. Is the final determining factor based upon the cost of equipment, its maintenance and the man hours involved in both filtration and maintenance?

These are difficult questions to answer, and the answer is not yet at hand because there are times when all the factors are not available.

There are occasions when over-enthusiastic manufacturers lay too much stress on longer periods between drains. Also, the tendency for some petroleum suppliers to stretch drain periods without consideration of all the factors, and again manufacturers of reclaiming equipment do, on occasion, over-stress the value to be received by installing a reclaimer. Each supplier is so wrapped up in his particular problem that sometimes each or all of us overlook one of the many variables encountered in reclaiming industrial lubricants.

The subject of this discussion, "Reclaiming Industrial Petroleum Products," is defined as, "to make serviceable for further use." By making serviceable, as applied to lubricating oils too, denotes the removal of all contaminants be they organic or inorganic, and renewing the product to its original characteristics. Here the question is raised, if a lubricant in its original state contains a certain percentage of additive, A, B, or C, and during the products use in service one or all of these additives can be used up or become incapable of doing the job they were intended to do, then the product cannot be brought back to its original specification or condition by filtration. This could also apply to a straight mineral oil as, in many instances, during its service period it is chemically changed and reclaiming becomes a very expensive and elaborate process.

Reclaiming can be divided into three main categories:

1. Gravity purification, such as settling by gravity, dry centrifuging and wet centrifuging.

2. Filtration, such as performed by mechanical filters, absorption filters, an adsorption filters.

3. Reclaiming by first heating lubricant, settling and chemical treatments in conjunction with the use of Fuller's Earth or finely divided clays.

Each of these methods strive and in many cases do an excellent job in reclaiming the lubricant for further serviceable use.

One of the questions most commonly raised by the user of petroleum products is, which type or method of reclaiming is best suited to my operations. To arrive at a logical answer, if such there be, to this question, a consideration of the following points is highly important:

1. The volume of lubricant to be reclaimed.

2. Does the lubricant contain additives? If so, will the reclaiming process remove those additives?

3. What additives, such as fatty acids, oxidation inhibitors, detergents, or emulsifiers, will be removed in the process of reclaiming?

An answer to these questions can be more accurately arrived at by a sample analysis of the reclaimed oil. The well defined ASTM method for testing lubricants is also the yardstick by which reclaimed oil should be measured. The look-see-smell and apparent results obtained by visual inspection after reclaiming do not supersede a qualified laboratory analysis. The chemical components of our present day industrial oils are too complex for anything other than a periodic analysis of the reclaimed product. There is nothing mysterious in reclaiming oil because, as stated in our opening 1, 2, 3 points, if these are satisfied then each is in harmony with the other; that is the equipment manufacturer, the petroleum supplier and the ultimate user.

A few examples of industrial reclaiming and a brief word on the problem. In modern turbine oils an oxidation and corrosion inhibitor is generally accepted as a must by the trade. When the reclaiming and filtration of the oil is completed in the system, the user is interested in several physical tests; these are, viscosity increase, neutralization or acid number. water by distillation, and the amount of insolubles in the oil. Does every reclaiming device warrant that these can be brought back to standard, because the user, in many cases, has set up a definite oil specification that the petroleum supplier must meet and certainly if he initiates such a specification he is desirous that it remain within a minimum and maximum limit during the product's life in service.

Take another series of industrial lubricants, such as cutting fluids. The user of cutting fluids bases his judgment of their efficiency on three general terms; better finish, longer tool life, and increased production. Better finish can be obtained if the micro particles are removed. These are the particles which tend to remain in the cutting fluid and become interposed between the cutting tool and the work, impairing tool life and finish, resulting in decreased production. Tool life can be improved by proper attention to clearances, speeds, and correct type of tool material. All of these are beyond the petroleum suppliers province. However, if they are correct, then the proper coolant, properly reclaimed, with a physical analysis periodically, benefits the consumer.

Another example is the use of circulating oils in steel mills. These oils are subjected to contamination with water, dirt, fatty acids (both animal and vegetable) which are entrained during the oils' cycle. While emulsion breakers are used, which remove the water quite rapidly, physical checks on the amount of fatty acids and other contaminants are imperative as they might have an influence on bearing corrosion. The mere fact that steel mills vary to a great extent in reclaiming and purification of their circulating oils is indicative of the immense problem.

Many mechanisms and the metals which comprise them are so varied, as are the tolerances, the methods of application for lubricant, and the fact that in many instances mechanisms are operating at maximum loads continuously, with the result that oxidation of the petroleum product and the complete removal of all contaminants becomes a difficult problem because some lubricating systems have a minimum capacity of lubricating oil, which tends to increase the oxidation and contaminant rate because of the short cycle between in-put of lubricant and return to sump.

Last but not least, we the suppliers of lubricants, the equipment manufacturers, the manufacturers of reclaiming equipment, and the lubricant user should work cooperatively to secure the desired results.

CENTRIFUGAL RECLAMATION OF INDUSTRIAL PETROLEUM PRODUCTS

by Kenneth D. Reed
The De Laval Separator Co.
New York, N. Y.

Mr. Reed is Technical Representative in the Industrial Division of the above company. During the past 21 years his duties have included service engineering as well as field research and development in connection with the De Laval centrifugal oil purifiers and puri-filters. Mr. Reed is a graduate of Northeastern University, Boston, Mass., and has been a member of A.S.L.E. since 1947.

Centrifugal force, which a humble shepherd boy named David applied to a stone, through a sling, brought instant death, many centuries ago, to a giant known as Goliath of Gath. This powerful force has been used in many ways since that time, an interesting application having been made several hundred years later by the Chinese who filled gourds with fruit juices and swung them rapidly in a circle to "purify" the liquid. This first crude harnessing of centrifugal force led to the development in 1878, by a young Swedish engineer named Gustaf De Laval, of the first machine to separate immiscible liquids of different specific gravities and also to remove sediments and other foreign matter from them.

Because of rising costs of materials and labor, the reclamation of industrial petroleum products, such as are used in industrial plants, is an economical "must." Centrifugal force, scientifically applied in the Centrifugal Oil Purifier as we know it today makes it possible to do this quickly and, in many cases, so economically that the savings in oils, etc., that would otherwise be discarded soon amortize the investment in the centrifuge.

This is because of the effectiveness of a force many thousand times the force of gravity that is generated in the bowl of a modern centrifuge. This force easily removes water, sludges and foreign matter that contaminate industrial petroleum products, thus reclaiming them in many cases from materials that are nearly useless because of their contaminations to products that can be used over and over again.

Whether it be turbine oil in a power plant, fuel or lubricating oil for diesel engines, cutting oils for automatic lathes, aqueous or mineral oil type coolants, mineral oils or synthetic products used as the hydraulic medium in many modern machine tools, or as the insulating medium in transformers, etc., centrifugal force will speed up the process of reclamation and frequently effect an improvement in the methods of making the end product.

Because of limitations due to lack of space, we cannot dwell on each application in detail. However, the centrifugal purification of turbine oils, whether of the straight mineral type or the newer inhibited type, is a well known process in the power industry. De-hydration of insulating oils to restore dielectric strength is also a well known use for centrifuges.

Complete lubrication systems, including centrifuges, for steel mills, paper mills, rubber mills and other heavy duty machinery are also recognized as important factors in the maintenance of industrial machinery.

The purification of diesel fuel oil is likewise quite well known as an important factor in efficient combustion of fuel oil in diesel engines. One of the more recent advancements in the reclamation of petroleum products is the use of Centrifugal Oil Purifiers and pressure type filters for the purification of diesel engine lubricating oils. This combination of the use of centrifugal force and micronic filtration at temperatures of approximately 180 F has made a marked difference in the performance of stationary and marine diesel engines wherever they have been installed. Marine installations range from fishing trawlers operating out of Boston, Mass., to two of the world's largest tin mining dredges operating in the waters off Netherlands, East Indies. Land installations include many Municipal Power Plants and the West Burke, Vermont, pumping station of the Portland Pipe Line Corporation.

In the field of cutting oil reclamation, it is now possible to install a completely automatic cutting oil reclamation plant which includes equipment for the crushing of long turnings, pneumatic handling of chips, centrifugal extractors or "chip wringers" automatically loaded and dumped, eliminating manual handling of the extractor basket, and pneumatically filled storage bins in which the dried chips can be held for loading into gondolas. An important part of a cutting oil reclamation system is the Centrifugal Oil Purifier which, with its heating and sterilizing tank helps to control, and in many cases, entirely eliminate dermatitis. Other benefits are obtained in the form of longer tool life because the oil is free of chips, etc., appreciable savings in annual cutting oil make-up costs, a decrease in the number of rejects, increased value of the ferrous or non-ferrous turnings because of their freedom from oil and, in instances where the completely automatic system can be installed, savings in labor.

Another new development, of great interest to automotive and diesel engine manufacturers is that of a motor block test system incorporating centrifuges and

pressure type filters. A typical installation is one at International Plainfield Motors, Plainfield, New Jersey, where this combination, together with the necessary thermostatically controlled electric heaters, pumps and other accessories handle the entire flow of 300 GPM through the test stands where the famous Mack Truck diesel engines are "put through their paces." A system of this type can, of course, be used in the manufacture of the larger marine and stationary diesels, as well as automotive engines.

The purification of oils used as the hydraulic medium in presses and many modern machine tools is also an important job for Centrifugal Oil Purifiers as the pressures used in hydraulic systems are such that they can easily aggravate the damage caused by some foreign materials scratching the surface of the cylinders, rams or pumps. The erosive effect caused by the high pressures will enlarge the scratches to a point where pressures cannot be maintained and, in many cases, inaccuracies will develop in the machine tool or other equipment using the oil as the hydraulic medium. Water is also a source of trouble as it causes rusting and the resulting oxidation of metal surfaces causes slight pitting which, again, is aggravated by the erosive effect of the high pressures used and, again, trouble is the result. The same trouble-makers cause high maintenance costs in the hydraulic pumps that are used on this type of equipment, so that it is usually quite easy to justify the installation of a Centrifugal Oil Purifier for the purification of hydraulic oils.

Centrifugal clarification of either aqueous or mineral type grinding coolants enables them to resist becoming rancid, reducing the hazard of infection among the operators. By keeping them free of abrasive and metallic particles, wheel dressing is minimized and, hence, wheel life is increased.

The use of clean coolant also produces better work since foreign matter cannot get between the wheels and the work to cause scratches. This means fewer rejects as well as less reworking of parts not damaged badly enough to be discarded.

These benefits and others that are experienced by using clean coolants result in a greater output of properly finished parts and a marked decrease in production costs.

RECLAIMING PETROLEUM PRODUCTS BY FILTRATION

by W. S. James
Fram Corporation
Providence, R. I.

Mr. James received his B.S. Degree of Mechanical Engineering at George Washington University. After many years of engineering experience with such companies as Studebaker and Ford Motor, he was elected Vice President in Charge of Engineering of the Fram Corporation. Mr. James was given the honorary award for Achievement in Science by the George Washington University. He is a member of numerous technical societies including the S.A.E., A.S.T.M., A.S.M.E., A.A.A.S. and is a Fellow of A.P.S.

In Mr. Cleaveland's paper, all phases of the reclamation of industrial petroleum products have been very ably

and completely covered. This paper will deal only with the removal of insoluble materials of colloidal size and larger, by means of filters.

In general terms, a filter is a "dirt magnet" in an easily cleaned "pocket" in which dirt is collected for removal at convenient intervals. The "dirt magnet" is the filter media which removes the insoluble particles from the oil flowing through it. This removal is usually accomplished by a combination of adsorption and mechanical straining. Fig. 1 illustrates the process of collection of a "filter bed" by the adsorption of minute particles on the fibers and the bridging of the interstices so that the size of opening through which solid contaminants must pass is reduced considerably below that of the original or clean filter media. An actual photograph of the build-

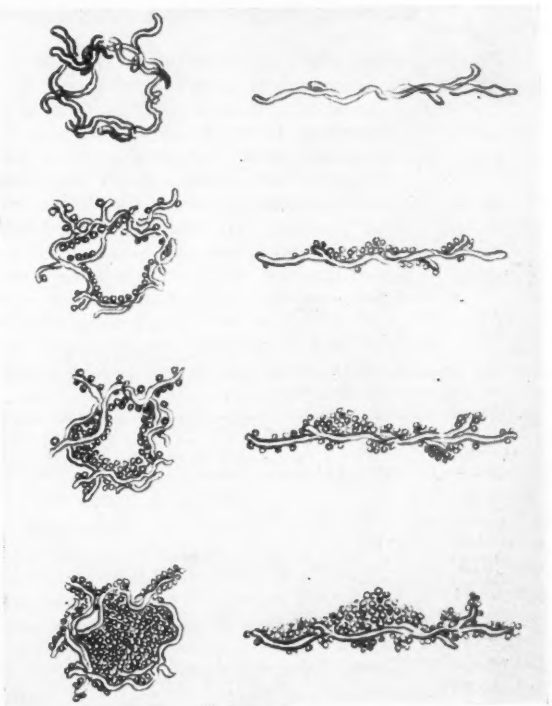

Fig. 1
Build-up of filter cake by absorption.

ing up of a filter bed, taken at a magnification of 200 diameters, is shown in Fig. 2. The particles seen clinging to the filter media fibers are from crankcase drainings and range in size from 0.1 to 1.0 microns, and are held by adsorption forces. In the process of filtration, particles of relatively large size but small enough to pass through the larger openings in the filter media may be moving at a velocity too great to be retained by the adsorption forces and will only be removed when the effective size of the interstices is reduced by the collection of smaller particles and a mechanical straining effect, sufficient to overcome their kinetic energy, is obtained. The action just described will take place in a deep unfelted bed of heterogeneously arranged fibers as well as in a shallower bed of felted fibers such as is found in filter paper or other felted materials.

The amount of dirt or contaminant in a lubricating system at any certain time is the difference between the amount of dirt which has entered the system and the amount of dirt having been removed from it by the filter. The quantity of dirt removed by the filter is the product of (1) the rate of oil flow through the filter, (2) the amount of dirt in a unit volume of the oil, and

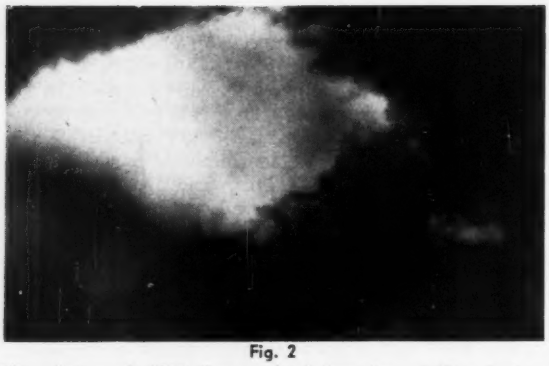

Fig. 2

Microphotograph (200 diameters) of formation of filter bed on cellulose fibers.

(3) the dirt removal efficiency of the filter. Because the dirt removal rate is dependent upon the amount of dirt in the system, if conditions remain constant there is a tendency for the system to reach an equilibrium in which the amount of dirt in the system is given by the relation shown in Fig. 3. This relation shows that both the equilibrium condition and the amount of dirt in the system at any one time are very dependent upon the product of (1) the number of times the volume of oil in the system is passed through the filter in a given time and (2) the efficiency of dirt removal of the filter in a single pass through it. In other words, a filter with a very high flow rate and a relatively low efficiency will give the same result as a filter with a very high efficiency and a relatively low flow rate.

$$\left(\begin{matrix}\text{Dirt in System}\end{matrix}\right) = \left(\begin{matrix}\text{Dirt Entering per Minute}\end{matrix}\right) \times \left(\begin{matrix}\text{Minutes}\end{matrix}\right) - \left(\begin{matrix}\text{Dirt Removed per Minute}\end{matrix}\right) \times \left(\begin{matrix}\text{Minutes}\end{matrix}\right)$$

$$G = g_e \quad t - g_r \quad t$$

$$\left(\begin{matrix}\text{Dirt Removed per Minute}\end{matrix}\right) = \left(\begin{matrix}\text{Rate of Flow Thru Filter}\end{matrix}\right) \times \left(\begin{matrix}\frac{\text{Dirt in System}}{\text{Volume of System}}\end{matrix}\right) \times \left(\begin{matrix}\text{Filter Eff.}\end{matrix}\right)$$

$$g_r = V \quad \frac{G}{Q} \quad \times \quad E$$

$$G = g_e \frac{t}{1 + \frac{VE}{Q}\, t}$$

$\frac{VE}{Q} = 0.1$ — G approaches 10 g_e

$\frac{VE}{Q} = 10$ — G approaches 0.1 g_e

Fig. 3

Numerical relation between dirt in system, efficiency of filter, and flow through filter.

As an illustration of the effectiveness of a high efficiency filter with a relatively low oil flow through it, the amount of wear on piston rings in two engines run in a "Dust Tunnel" under very severe dust conditions was 15% greater when no oil filter was used and when both engines were run with no air cleaner on the carburetor. When a good air cleaner was used on the carburetor the run without an oil filter showed almost 50% more wear than when an oil filter was used. The results of the runs made with good air cleaners on the carburetor showed 10% greater wear on the top ring and 75% greater wear on the bottom (oil) ring when no oil filter was used. When no air cleaner was used on the carburetor air, there was almost no difference between the wear on the top and bottom rings with and without oil filters. The wear when no cleaner was used on the carburetor air was, however, about twice as great as when good cleaning was provided.

In the same tests the wear on the bearings as indicated by weight loss was twice as great when no oil filter was used as when one was used. This result was obtained either with or without good carburetor air cleaners.

The improvement from the use of the oil filter was also indicated by the percentage of naphtha insolubles in the oil at the end of the tests. In the case where no oil filter was used, the naphtha insolubles reached 5.00% while with the oil filter they only reached 0.2%, a twenty-fifth as much. Practically none of the solid particles found in the oil samples after the run in any of the tests exceeded 5 microns.

Although the foregoing example is of oil reclamation during use rather than the reclamation after use and for re-use, the principles at work are identical and the effectiveness of a continuous method of oil cleaning is illustrated.

AVIATION LUBRICATING OIL RE-REFINING PRACTICE

by J. T. Hendren
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Mr. Hendren attended Temple University and joined Pan American in 1930 as Chief Chemist, which post he still occupies. Mr. Hendren is a member of several SAE, CRC and ASTM technical committees.

The term "reclaiming" may be considered as somewhat loose and can cover any treatment from merely pouring through a screen up to a complete re-refining process. Where aviation lube oils are concerned the process must be complete and therefore it is preferred, for purposes of this discussion, to use the term "re-refining" instead of reclaiming. A true re-refining process includes vacuum distillation, clay contact treatment, steam stripping and filtration. Anything less than this is considered inadequate for aviation oil. The most important consideration in aviation is safety, and to get safety we must have dependability, particularly dependability of the power plant. No economy, however attractive, can be justified if dependability suffers. Therefore, quality of the re-refined product is of paramount importance. The aim is to restore the used oil to its original properties, and any process which falls short of this goal is not good enough. Furthermore, constant vigilance in process control is necessary, and to this end laboratory inspection is essential, not sporadically or periodically but on every batch.

The gathering war clouds and need for conservation of materials focused attention in our company on the subject of oil re-refining, and a thorough study of the matter was made during 1941. By the spring of 1942 certain of the aircraft engine manufacturers, airlines, and military services had gathered experience in the use of re-refined oil, upon which we were able to draw. Even with this background of experience we felt that we wanted to see for ourselves, so we conducted some flight tests in a DC-3. One engine was operated with new oil entirely and the other with re-refined oil entirely.

The engines were permitted to go to full overhaul periods, at that time 700 hours, the oil being changed at 150 hours. Both engines were given detailed inspections at teardown, and no significant differences could be seen, nor were there any operational irregularities. Still in a skeptical frame of mind, we then operated for several months all engines of six aircraft segregated on a war time training program, inspecting engines and looking all the while for evidence of operational difficulties. None were found and engine condition held up well. Accordingly, we took the plunge and put the entire Latin American Division fleet on a limited diet of re-refined oil. The reason for the limitation was practical rather than technical. Oil consumption on aircraft engines runs from one-half gallon to one and one-half gallons per hour. Therefore there is never enough re-refined oil to go around even at a main base. Consequently, most of the oil that goes into the engines will be new oil. It is our custom to use re-refined oil mixed with new without any differentiation between them. In the intervening years, overhaul times have gone up to as high as 1300 hours on some engines, and oil drain periods have been eliminated altogether. Even with these tougher conditions we have yet to find any difficulty that can be traced to the use of re-refined oil.

The process as carried out by our company starts with the collection of drainings. Special care is taken to keep out of the charging stock such materials as mineral spirits and hydraulic fluid. The former can be removed by the distillation process but economic penalties result. The latter cannot be completely removed, and its presence in more than trace quantities may prevent restoration of the original properties. Drainings are collected in a tank truck, one compartment of which is used exclusively for this purpose. In the re-refining equipment a heat exchanger preheats the charging stock which is them agitated with clay prior to entering the still. In the still a vacuum distillation is conducted during which most of the light materials pass overhead. As the still temperature is raised steam is injected moderately to complete the stripping. The oil and suspended clay are then passed through a filter press which removes the solid contaminants and the clay. The final product then goes to an intermediary storage tank while waiting for laboratory examination and approval. The customary laboratory tests are run including color, viscosity at 210 F and 100 F, flash and fire, Conradson carbon residue, ash, and total acid number. It is a well recognized fact that such tests on an unknown oil do not in themselves adequately define quality for aviation use, but they do serve well to establish that original properties of a known oil have been restored. Following laboratory test and approval the re-refined product is pumped to the main storage tank. Additional tests of oxidation stability, bearing corrosion tendencies, and wear have also been conducted for us on occasion by engine manufacturers and oil companies. The results have compared favorably with the new oil.

After the needs of safety have been answered, thought in the direction of economics is in order. Some data are available from various sources on savings which might be realized from the use of re-refined oil, but customs and conditions vary so widely that it is difficult to name a cents-per-gallon figure. It is our belief that a good working figure for aviation usage is about one-half the cost of new oil. As pointed out earlier elimination of oil drains and extension of engine overhaul time have taken place in the past few years, and this has tended to lower the overall savings. However, savings are possible if the operation is large enough, and that is why in our company we restrict our re-refining to the largest main base.

It is sincerely hoped that this discussion will not be construed as a blanket endorsement of any and all processes for restoring aviation oils. No one realizes more than ourselves the dangers of loose practices in this field. The sole purpose of this presentation has been to describe the procedures of one company and why these procedures are considered to be sound.

RECLAMATION OF CRANKCASE LUBRICATION OIL FOR RAILROAD DIESEL LOCOMOTIVES

by Wayne Lasky
G. M. & O. R. R. Company
Bloomington, Ill.

Mr. Lasky received his B.S. Degree in Chemistry at Illinois Wesleyan University. He joined the Alton R. R. as control chemist, later was appointed Chief Chemist. In May, 1947, the Gulf, Mobile & Ohio R.R. merged with the Alton R.R. Mr. Lasky, in 1948, was then appointed Engineer of Tests, heading the Test Dept. of the Gulf, Mobile & Ohio R.R. He is a member of numerous technical societies including A.S.T.M., S.A.E., A.C.S., A.I.C. and A.S.L.E.

I. Definition of Reclamation as Applied to Petroleum Products

Reclamation is defined, by Webster, as the act of recovering possession or in the case of oils, the act of clarifying used lubricants. To clarify means to make pure and clear. In the process of reclamation of railroad diesel crankcase drainings, we think the word "Restoration" is more applicable. Webster defines "Restoration" as the act of "putting back into nearly the original form." That is what we attempt to accomplish with the equipment and procedures the railroads have adopted for processing diesel crankcase drainings.

To distinguish these procedures from other methods of reclamation, it is called the process of "Re-refining and Fortification" of Railroad Diesel Crankcase Oil Drainings.

II. Oil Handling—Refinery Equipment and Procedures

To better understand the program of reclamation, on a railroad, let us briefly discuss the oil handling practices and the source of the drainings.

(a) *Oil Handling*

Several different brands of oil are used by the railroad. All of the oils are the heavy-duty additive type, similar to those required by Army Specification 2-104B. All brands of oils are kept rigidly segregated. Different brands of new oils, different brands of crankcase drainings or different brands of re-refined oils are never mixed — intentionally. The oil is drained from the crankcases at such time as some property of the oil reaches a condemning limit. Oil samples from all passenger and freight engines are inspected and analyzed at least once every day. Fif-

teen terminals on the railroad are equipped with small laboratories where the condition of the oil can be determined. The main causes for an oil to be drained from a crankcase are:

1—excessive fuel dilution,
2—water in the oil,
3—mechanical failure, causing metal contamination,
4—loss of additive effectiveness resulting in a rapid rate of oxidation and the loss of dispersant characteristics.

The drainings are shipped in drums to central points on the railroad and then forwarded to the railroad refinery. At the refinery the drainings are placed in large storage tanks where considerable water and sludge are removed by settling.

(b) *Refinery Equipment*

The re-refining equipment used, consists of an open mixing tank, an electrically heated retort, a vacuum pump, a condenser, a dilution tank, a contact tank, a filter press and several other motors and pumps. The other refinery equipment includes several large drainage storage tanks, settling and preheat tanks, re-refined batch storage tanks, equipped with electric heaters and stirrers for blending additives into re-refined oil and an interconnecting system of piping and pumps to transfer all oil mechanically.

The drainings are pumped from large outside tanks to heated settling tanks in the refinery. Small batches of drainings are then pumped from a settling tank to an open mixing tank, and agitated with activated clay. The clay and oil after heating are drawn into the retort and distilled under vacuum. Water and fuel dilution passes through the condensor in to the dilution tank. The maximum temperature reached in the retort is from 525 F to 550 F. Oil in the retort is then "steam stripped" and finally dropped into the contact tank, where if necessary filter-aid is added. The oil, clay and filter-aid are kept agitated and pumped through the filter press. If the finished oil meets the specifications for viscosity, naphtha insoluable and color, it is pumped to one of the batch storage tanks. When enough oil has been processed to fill the batch tank to the proper level, the oil is then heated to 150 F-175 F and a measured amount of additive concentrate is pumped into the batch tank and the mixture is thoroughly agitated. Each batch must meet the specifications for new oil, by laboratory tests, before being released for use.

Although this discussion deals mainly with the results obtained from a small railroad operated refinery, equally satisfactory results have been obtained with oils processed by a commercial reclaimer under Test Department supervision. Railroads, that do not have a large enough volume of drainings to warrant the installation of refinery equipment, can economically afford to have their drainings processed by a commercial reclaimer. However, the oil handling and reclamation procedures and the reclaimer's equipment should be carefully investigated before selecting the reclaimer to process the drainings.

III. Quality of Re-refined, Fortified Product

Refinery procedures are adjusted for each brand of oil so as to produce a finished product having the same physical and chemical properties as the new oil.

The following chart (Table 1) shows a typical analysis of a crankcase draining — the resulting re-refined oil before fortification—the re-refined oil after additive has been added, and the supplier's specification for new oil.

TABLE I

BATCH 54—TANK 5

	Crankcase Drainings	Re-refined Oil Not Fortified	Re-refined Oil Fortified	Specifications New Oil
Viscosity, SSU @ 100 F.	781	955	913	900-1000
Viscosity, SSU @ 210 F.	74.0	79.7	79.1	79-81
Viscosity Index	83	78	82	75 Min.
S.A.E. No.	40	40	40	40
Flash Point, °F	380	460	445	430 Min.
Fire Point, °F	435	520	505	...
A.P.I. Gravity	...	25.0	24.9	24-27
Ash, % by Wt.	0.14	0.01	0.20	.19-.21
Naphtha Insolubles, %	0.29	Nil	Nil	...
Chloroform Solubles, %	0.18	Nil	Nil	...
Extraneous Solids	Trace	Nil	Nil	...
Water	Present	Nil	Nil	...

In Table 1 the viscosity and flash point analyses indicate the presence of fuel oil in the drainings. The naphtha insolubles and chloroform solubles indicate the presence of carbon and oxidation products or sludge. The extraneous solids and water determinations show metal and/or dirt and water to be present.

These same analyses of the re-refined oil, not fortified, indicate that all of the contaminants have been removed. The ash content being 0.01% indicates that all additive material has also been removed.

The only noticeable difference in the oil analyses after fortification is in the ash content which in this case is 0.20% and reflects the amount of additive added to the oil during fortification. The ash analysis can be used as a check to determine if the correct blending of the additive concentrate has been accomplished.

It will be noted that the re-refined, fortified oil meets all of the specifications for new oil.

Whenever a new brand or type of oil has been re-refined, it is subjected to rigid bench tests and laboratory engine tests to establish its comparative quality with that of new oil. Oxidation stability, dispersant characteristics and lacquer forming and deposition tendencies are determined. Lauson, Chevrolet or Caterpillar engine tests are run and the results compared with those of the new oil.

It has been found possible to produce re-refined, fortified oils that rate equal in quality to the original new oil and in some instances show a slightly higher rating than the new oil.

Tables 2 and 3 show the results of comparative bench tests of re-refined oil, re-refined fortified oil and new oil. The tests reported are MacCoull Corrosion Test, Toettcher Varnish Test and the Indiana Stirring Oxidation Test.

TABLE II

BRAND "A"—DIESEL LUBRICATING OIL S.A.E. 40

Mac Coull Corrosion Test @ 350 F	Re-refined Not Fortified	Re-refined Fortified	New Oil
10 Hr. Wt. Loss, Mg.	82.0	2.0	5.0
Neut. No.	8.2	1.26	1.98
Remarks	Corrosive	Non-Corrosive	Non-Corrosive
Toettcher Varnish Test @ 350 F			
Varnish—Wt., Mg.	5.0	0.5	1.1
Remarks	Low Med. Varnish	Negligible Varnish	Low Varnish

The results of the MacCoull Corrosion Test, shown in Table 2, show the re-refined oil without additive to be quite corrosive in comparison with the re-refined,

TABLE III

INDIANA STIRRING OXIDATION TEST

300 ML Oil—330 F—1300 RPM, Glass Stirrer
72 Hrs. Copper and Iron Catalyst—Aluminum Rod

BRAND "B" OIL

	Re-refined Not Fortified				Re-refined Fortified				New Oil			
	Start	24 Hrs.	48 Hrs.	72 Hrs.	Start	24 Hrs.	48 Hrs.	72 Hrs.	Start	24 Hrs.	48 Hrs.	72 Hrs.
Viscosity, SSU @ 100 F	885	1306	2002	3215	870	1064	1182	1316	871	1032	1129	1238
Tan-E	.45	2.80	7.28	10.19	.34	2.35	3.14	3.92	.00	2.13	2.58	3.53
% Naptha Insolubles	.14	1.36	5.54	9.84	.25	.89	1.35	2.09	.21	.68	.70	1.51
% Chloroform Solubles	.022	1.08	4.72	6.88	.08	.33	.87	1.54	.05	.15	.12	.93
Aluminum Rod Lacquer Rating	...	9	7	6	..	10	10	10	..	10	10	10

fortified oil and new oil. In this test the weight loss of the metal and the resulting neutralization number of the oil samples show that the fortified, re-refined oil rates slightly better than the new oil.

The results of the Toettcher Varnish Test, also shown in Table 2, indicate that the fortified, re-refined oil has less tendency to deposit varnish than either of the two oils.

In Table 3, the analyses of the oil samples from the Indiana Stirring Oxidation Test indicate that the re-refined oil without additive is much less oxidation stable than either the fortified, re-refined oil or new oil. In this test the re-refined oil however would be rated a shade less stable than the new oil. However, this re-refined, fortified oil sample appeared to be more stable than some of the new oils of other brands that are being offered to railroads for diesel lubrication.

From the results of the above tests, we believe that re-refined, fortified diesel oils are of satisfactory quality to use as new oils in all classes of diesel locomotive engines in all types of service.

IV. Economics—Costs and Savings

Railroads with a small percentage of diesel power can use their crankcase drainings for free oiling in shops, rails, etc. Some railroads reclaim their drainings by various methods, without fortification and use this oil in engines that do not require heavy-duty type oil. However, as a railroad becomes more fully dieselized, a point is reached when the volume of crankcase drainings is too large to be used for these purposes. A more economical method of using this oil has to be adopted. Table 4 shows typical costs for re-refining and fortification for a one month period.

These figures show that re-refined, fortified oil can be processed for approximately $0.176 per gallon, including cost of material, labor and fortification. Based on the cost of new oil at $0.461 per gallon, this indicates a saving of $0.285 per gallon. During a year's operation, processing an estimated 72,000 gallons of re-refined, fortified oil, a gross saving of $20,520.00 can be shown. Allowing approximately 20% additional costs to cover depreciation, interest on investment, taxes, supervision, etc., a net savings of $15,000.00 can be expected.

V. Problems of the Future

We feel as if we have a satisfactory reclamation practice in effect, but have by no means discontinued work and study of re-refined, fortified oils. Indications at the present, are that many railroads will soon be mixing diesel lubricating oils in service. It is necessary, for business reasons, for most railroads to use several different brands of oil. Considerable savings in oil handling can be expected and lower inventories can be maintained, if diesel lubricating oils can be satisfactorily mixed.

TABLE IV

RECLAMATION COSTS AND SAVINGS
"A" BRAND OIL—JANUARY, 1950

Crankcase Drainings, Gallons	6480
Total Oil Recovered, Gallons	5274
% Recovery	81.4

MATERIALS USED, LABOR, ETC.

2,520 Lbs.	Retrol	@	$0.042	$105.84
1,584	Filter Papers	@	0.019	30.10
51,840 Gals.	Water	@	0.02/M	10.37
3,456 KWH	Current	@	0.01	34.56
12 Gals.	Solvent	@	0.96	11.52
15 Lbs.	Rags	@	0.242	3.63
20 Lbs.	Waste	@	0.103	2.06
323 Hrs.	Labor	@	1.45	468.35

Total Expense	$666.43
Cost of Re-refined Oil $\frac{666.43}{5274}$	$0.126/Gal.
Cost of Additive for Fortification	0.05 /Gal.
Total Cost of Re-refined Fortified Oil	$0.176/Gal.
Cost of New Oil	$0.461/Gal.
Cost of Re-refined Fortified Oil	0.176/Gal.
Gross Savings	$0.285/Gal.
Total Oil Reclaimed (Estimated)	72,000 Gal./Yr.
Total Gross Savings	$20,520.00/Yr.

However, the mixing of oils will create new reclamation problems such as:

(1)—Can mixed diesel oils be satisfactorily re-refined?

(2)—What specifications can be used for control?

(3)—What type of additive should or can be used for fortification?

Some work along this line is currently in progress and, so far, the results look promising.

Although it is possible to satisfactorily reclaim railroad diesel crankcase drainings it is desirable and more economical to extend the drain periods of diesel crankcases as long as possible. Improvement in design and material by the engine builder and rigid maintenance of equipment by the railroads have greatly increased the mileage between oil drains that were necessary due to fuel dilution, water in the oil and mechanical failures. Mileages upward to 400,000 miles have been obtained without changing oil in some types of diesel engines.

With the advent of higher output engines it has been found that extended mileages were not practical due to the depletion of the additive in the oil, at low mileages, in some instances after 30,000 to 40,000 miles of service.

Recent field tests have indicated that extended mileages can also be expected in high output engines if additional additive is added to the oil in the crankcase periodically. If the quality of the oil in the crankcase can be maintained in these engines, by some such method, it will then be possible to again greatly reduce the amount of crankcase drainings accumulated.

OIL FILTRATION IS LUBRICATION INSURANCE

by Edwin M. May
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It was not so many years ago that oil circulating systems were the exception rather than the rule. Lubrication of bearings was accomplished by dip or splash application such as ring and collar oiled bearings or enclosed crank cases, or by drip from an oil cup.

Oils available then were not as carefully produced, nor were they as expensive as they now are. However, economic considerations also played a part then and the engineer quite frequently batch-filtered his oil in order to save as much of his employer's capital investment as possible.

With the introduction of reciprocating engines and steam and hydraulic turbines having enclosed frames, the oil circulating system became a "must." Today we find that practically every prime mover, mill and industrial machine is lubricated by an oil circulation system.

Why is this done? It is done not necessarily to save oil—which in itself is essential—but to keep that prime mover, machine or mill running without having to stop because of lubrication troubles. With increased output demands from their customers, the manufacturers have necessarily had to improve their equipment. This has made possible higher steam pressures, higher bearing pressures and increased rotative speeds. All these factors tend to contribute towards greater efficiency and productive ability.

In turn, the oil producers met this challenge by improving their oils to a point of efficiency and longevity that in the earlier days would have been thought impossible.

However, the bug-a-boo of circulation systems is contamination of the oil by outside sources. Even though a machine has a perfectly sealed-in lubricating system—as, for example, the electric refrigerator—the oil may in time be affected by the entrance of undesirable foreign matter such as metallic impurities and the possible entrance of atmospheric moisture.

Whether it is oil used as a bearing lubricant or as a coolant, it is recirculated over and over again in order to perform its basic function of preventing metallic contact between rubbing surfaces. If this oil film between these moving parts is ruptured for any reason whatsoever, bearing failures will ensue and make it necessary to stop the machine. This is the point at which the operator of the machine loses production which to him means dollars.

Now what can prevent or forestall such an occurance? By interposing an oil purification device in the circulating system, the operator then rests assured that his machine will not be shut down by contaminated oil, provided the proper type of filter or purifier is used.

It has been definitely established that for continuous operation the oil must be kept clean and that the filtering device is positive INSURANCE against such shutdowns.

What must be removed from lubricating oils or coolants in order to permit them to play their part in this production program?

This, of course, depends on several things. First, the type of the machine may in itself produce contaminants, or they may come from the surrounding atmosphere. The machine may permit moisture to enter the oil—as in the case of steam turbine gland leakage—or, because the bearings are not perfectly sealed, may permit the ingress of atmospheric moisture, gases, fly-ash, dust, dirt, etc., from the ambient.

If these contaminants are not promptly and continuously removed, their fouling or abrasive action is cumulative. This is well exemplified in the case of a reduction gear set not being lubricated by a circulating oil system. If it depends on dip lubrication only and pitting action starts on the teeth, the fine metallic particles so released get into the oil and will then be carried around at each cycle, thus setting up further abrasive action and eventually causing a stoppage.

The writer can cite such an instance which occurred at a paper mill in northern New York. A speed increaser set (the opposite of a reduction gear) was in use between a water wheel and a section of the paper mill. The speed increaser set was of a nationally-known make and lubricated by the dip system. In about a year's time, they had to shut down and order the gears to be rebuilt at a cost of $4000.00. About three weeks' production was lost on that particular machine. A small oil circulating and filtering system was ordered at a cost of about $1500.000 and installed when the gears were put back in the set. That was nineteen years ago and there has been no shutdown due to lubrication failure since then.

This surely demonstrates that filtration is insurance—because they could not have recirculated successfully all of that time with contaminated oil.

Take the case of a large paper board mill in New Jersey. This machine was of a well-known make and had 230 points of lubrication on the dryer rolls. These rolls were built 8-high and are known as stack dryers. It was very hot around the upper rolls. This machine was fitted with force feed oilers of the non-circulating type, which meant it was what is known as an "all-loss" system. Consequently, the bearings did not get nearly the amount of oil they required with the result that one bearing after another was lost and the expense of machine outage was terrific. Finally, an oil circulating and filtering system was installed and they had no more trouble thereafter.

In the treatment of oils for re-use, the words reclamation, filtration, clarification, purification, straining, etc., may be considered more or less synonymous. All these terms are found in Funk & Wagnalls *Standard Dictionary* or Roget's *Thesaurus.*

Some types of equipment, of course, do more than just filter the oil in order to bring it back to its original lubricating value. The oil may be heated to reduce its viscosity in order to permit better precipitation of water and solids or easier removal of them by centrifuging, or filtration through suitable filtering media. Or it may be subjected to the vacuum process for removal of moisture, water soluble acids, and air or gases. In some cases, it is necessary to use an adsorbent type of filter employing the use of Fuller's earth or Attapulgus clay. Then again there are filters using the well-known dia-

tomaceous earth filter aids. These latter are not to be confounded with adsorbent filters as their action is entirely different. Diatomaceous earth is purely a mechanical filter medium whereas the earth or clay filtering media have the power of attracting and holding minute impurities and certain undesirable acids.

DISCUSSION

By Jules P. Kovacs
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Mr. Kovacs is vice-president in charge of engineering for Purolator Products, Inc. He joined the company after studies at Newark Technological Institute and the Newark College of Engineering, and design work with Westinghouse Electric, Standard Oil Development, Wright Aeronautical Corp. and others. Mr. Kovacs holds several important hydraulic patents and is a member of many engineering and hydraulic societies.

The previous papers presented have indicated that there is, under certain circumstances, a definite need for oil re-refining. More emphasis should be placed upon the distinction between "oil re-refining" and so-called "oil reclaiming." There are many procedures of both types in use, all of which have their advantages and disadvantages. Where oil reclaiming or oil re-refining is used, particular emphasis should be placed upon the economic aspects involved.

In the case of present heavy duty oils, the inhibitors and additives are materially affected by high temperatures and by water. This naturally affects the life of the oil. Using some types of re-refining and reclaiming processes, these inhibitors and additives can be completely removed from the oils. If one particular type of oil is used and the re-refining process is conducted with the cooperation of the original refiner and manufacturer, it may be possible to replace the additives and inhibitors which have been removed. However, a great problem exists with mixtures of various oils. These oils may be processed from different base stock crudes and also contain various types of inhibitors and additives to a lesser or greater degree. It is readily discernible that a condition of this type could result in a very complicated operation due to mixing the crudes, inhibitors and additives.

One particular phase of the filtration aspect involved has not been stressed. Proper filters are designed to keep the oil free of contaminants throughout the natural life of the oil without disturbing inhibitors or additives. This process is quite different from a reclaiming or re-refining process in which the contaminants are permitted to build up in the oil and may cause damage to moving parts during this build-up. The main purpose of a filter is to prevent this build-up of contaminant during the period that the oil is in service, therefore prevent the possibility of damage to the moving parts during this period of time.

The tendency throughout the filtration and allied industries, at the present time, is towards full-flow micronic filtration so that all moving parts can be protected at all times from contaminants which might enter or be formed in the oil. There are undoubtedly other processes that are satisfactory under certain circumstances, but it is believed that, if used, they should be supplemented by filtration.

RE-REFINING OF USED MINERAL OILS BY TREATMENT WITH ACTIVATED CLAY AND HEAT

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ABSTRACT

Equipment designed for re-refining of used lubricants and other mineral oils by medium or large-scale users of these oils is discussed. The re-refining equipment described is for treatment of the used oils with contact clay at temperatures up to 275 F to 600 F depending upon the type of oil and the extent and nature of contamination. Supplementary steam stripping primarily for removal of fuel dilution may be used if desired.

The clay adsorbs resinous, asphaltic and some organic acid type impurities. Heat evaporates water and other volatile impurities from used oil and increases the re-refining activity of the clay.

Suitable applications of re-refining processes are discussed.

A suggested re-refining installation is shown and a re-refining processing treatment is described.

It is estimated that usually 95 to 99 percent of the original components in lube or industrial oils are unchanged by use.

The principal types of contaminants likely to be present in lube, transformer and industrial used oils are listed. The general types of contaminants removed by each heat (and or steam), clay and by filtration are listed.

The separate effects of heat; heat and steam; heat and clay; and heat, clay and steam on physical and chemical properties of a typical lot of used diesel lube oil are tabulated. These properties are also compared on a typical used, "as new," heat and clay re-refined and heat, clay and steam re-refined aircraft oil. Representative test results obtained on batches of used oil re-refined by commercial re-refiner users are shown.

Estimated re-refining costs for three different types of used oils are tabulated.

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THE FULL TEXT OF THIS PAPER WILL BE PRESENTED IN THE DECEMBER, 1950, ISSUE OF *LUBRICATION ENGINEERING*.

GENERAL GREASE CHARACTERISTICS versus BEARING REQUIREMENTS *

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Mr. Roehner received his Bachelor of Chemistry Degree from Cornell University. During his six years with the Braden Copper Co., a subsidiary of Kennecott Copper Corp., he worked in South America, beginning as a chemist, advancing to test engineer and finally chief chemist. In 1930 Mr. Roehner affiliated with the Standard Oil Co. of New York as supervisor of Product Development. His present position is that of Technical Director of the Technical Service Department of Socony-Vacuum Laboratories. He is a member of numerous technical societies, including A.S.T.M., N.L.G.I., A.C.S., A.O.S. and A.S.L.E.

From one viewpoint, progress in the grease industry has promoted confusion instead of simplification. Not many years ago there were only a few types of greases available in commercial quantities. Today lubrication engineers have extensive lists of products of widely different characteristics and those lists are steadily being extended by new greases having distinctive properties. It, therefore, becomes more necessary for the engineer to deal with fundamentals instead of relying entirely on memorization of the limitations of individual products. One approach to the problem is to define the requirements of the bearings in terms of the characteristics of the greases which will satisfy those conditions. Such an analysis usually means consideration of the following factors:

1 — Method of Application
2 — Bearing Operating Conditions
    Temperature
    Speed
    Load
3 — Frequency of Application
4 — Contaminants
5 — Bearing Design
6 — Costs

The effects of the above factors obviously interlock and their relative importance varies with the particular problem involved.

Method of Application — The requirements of the bearings should dictate the characteristics of the greases selected, but that reasoning is not always followed because the devices provided for applying the greases may not be capable of handling them satisfactorily and, moreover, compromises may be necessary because there may be good reason for not obtaining more suitable dispensing equipment. Sometimes a more careful study of such a conflict will show that the cost of new equipment will be considerably less than the repair expenses resultant from the use of an improper grease.

When cups, screw-down and spring-loaded, are employed to apply grease, consideration should be given to the resistance of the product to separation of its oil, i.e., its separability characteristics. This property is also important when it is necessary to avoid the concentration of soap which would interfere with the movement of metering valves in long line, centralized automatic greasing systems. Usually separation of oil is attributed to one cause, i.e., application of pressure. Actually separation is the result of a filtering action and pressure enters the problem primarily as an accelerator of the rate of filtration. This point was demonstrated in a series of tests in which a conventional calcium base No. 1 cup grease, made with a 105 second at 100 F, viscosity pale oil, was tested under 8 psi and 3000 psi pressure. Over 25% of its oil content separated within 100 hours in the first case; no free oil was found even after 100 hours at 3000 psi pressure. The reason for this contradiction of the usual expectation lies in the difference in design of the containers. In the former, the grease was charged to a spring loaded cup and the oil was squeezed out through the narrow clearance between the plunger and the side of the cup, or, in other words, where a pressure drop existed. The clearance was sufficient to hold back the soap. In the latter, the grease was, in effect, entirely sealed in a section of pipe by completely closing a valve at each end. No filtration could occur and no free oil was found when the valves were opened.

[1] Factors which affect separability are those which hinder or promote rates of filtration, i.e.:

Grease Structure
Percentage of Soap
Viscosity of Mineral Oil Component
Temperature
Time
Pressure

The effects of each of the above factors can be demonstrated by the use of the Separability Tester illustrated in Fig. 1. For example, a series of conventional calcium soap base greases made with a 105 second at 100 F viscosity pale oil and differing only in percentages of soap and consistencies were run in that tester at a pressure maintained at eight pounds. The results are given in Table I. In a corresponding series of tests, wherein the soap and consistencies were kept practically the same but the viscosity of the mineral oil component was varied from 105 seconds to 850 seconds at 100 F, the results obtained were those tabulated in Table II.

The separation of oil in dispensing devices may be connected with so-called bleeding or occurrence of free oil of greases while in storage in the shipping container or in bearings. The extent of that connection has not been definitely established but there is good reason to

* Paper presented before the Philadelphia Section of ASLE.

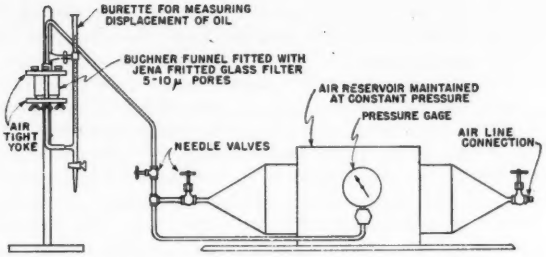
BURETTE FOR MEASURING DISPLACEMENT OF OIL
BUCHNER FUNNEL FITTED WITH JENA FRITTED GLASS FILTER 5-10μ PORES
AIR RESERVOIR MAINTAINED AT CONSTANT PRESSURE
PRESSURE GAGE
AIR TIGHT YOKE
NEEDLE VALVES
AIR LINE CONNECTION

Fig. 1

Grease separability tester.

TABLE I
EFFECT OF PERCENTAGE OF SOAP

Calcium Soap	ASTM Worked Penetration	Hours to Separate 5% Oil	10% Oil	25% Oil
10.6%	357	6	18	100
11.5%	305	10	34	184
16.8%	254	13	47	272
20.2%	200	47	185	+400

TABLE II
EFFECT OF VISCOSITY OF MINERAL OIL COMPONENT

S.U. Viscosity at 100 F sec.	% Soap	ASTM Worked Penetration	Hours to Separate 5% Oil	10% Oil
850	15.0	255	95	245
500	16.5	257	40	135
285	15.5	262	24	103
105	16.8	254	13	47

suspect that the connection may be quite direct.

As already mentioned, the ability of available grease guns may be an important factor determining what grease will be selected. This is certainly true in respect to the pressure guns used in service stations for chassis greases. With any given gun there are two properties of greases which determine the ease with which they can be pumped. The rate of delivery of the gun will be determined not only by its own design but also by the slumpability and pumpability of the grease. Slumpability is a coined term which may be defined as the tendency of the grease to slump in the reservoir of the gun and feed to the pumping mechanism. In other words, it is an indication of the amount of pressure or head which must be applied to the grease at the reservoir temperature, in order to start the flow or feeding of the grease to the pump. After the grease enters the pump proper, then pumpability is the factor so far as properties of the grease are concerned. Investigation of difficulties with obtaining the desired rate of delivery may uncover one or more of the following causes.

Wherein the grease is involved:

1. Low slumpability, therefore, no priming or steady flow to the pump.
2. Low pumpability or excessively high apparent viscosity.
3. Concentration of soap due to poor resistance of grease to separation at narrow clearances.
4. Clogging or interference due to foreign material.

Wherein the pumping system is involved:

1. Insufficient provision for insuring feed of grease to the pumping mechanism.
2. Low pump pressure capacity.
3. Lines may be too small in diameter and too rough in inner surface so that pressure available will not overcome line resistance.

Mention was made of the apparent viscosity of greases which is the equivalent of viscosity of mineral oils.[2] Due to the presence of the soap structure of greases, the determination of the former is complicated by the fact that it is dependent on rate of shear or rate of flow.[3] The viscosity of an oil, on the other hand, is independent of the rate of shear. The effect of that variable on these two types of products is demonstrated by the data given in Table III. As the rates of shear increase, the apparent viscosities of conventional greases approach the viscosities of their mineral oil components.

TABLE III
COMPARATIVE VISCOSITIES OIL AND GREASE
Viscosity in Centipoises @ 100 F

Rate of Shear	25 Sec.$^{-1}$	1000 Sec.$^{-1}$	10000 Sec.$^{-1}$
Oil	50	50	50
Lime Base Grease 11% Soap	3000	320	180

Pumpability is a function of apparent viscosity at the operating temperature and not of ASTM worked penetrations at 77 F. Two greases may have the same ASTM penetrations but differ widely in respect to their rates of delivery from a given gun or centralized dispensing system. This fact is illustrated by the results shown in Table IV.

TABLE IV
PUMPABILITY AT 77 F

Grease	Worked Penetration	Apparent Viscosity Poises at 100 Sec.$^{-1}$ Shear Rate	Pumpability Balcrank Gun Grams/Min.
1	Semi-Fluid	235	320
2	240	50	2020

Summarizing the foregoing comments, it may be stated that the limitations of equipment or devices for applying the greases are important factors which must be considered along with the requirements of the bearings to be lubricated. The best lubricants when improperly applied have a difficult job protecting the bearings.

Bearing Operating Conditions — Mineral oils and greases behave differently as operating temperatures rise toward their upper limits. Based on visual inspection, the only apparent change that an oil undergoes is loss of viscosity, but if a grease at an elevated temperature is compared with the same product at room temperature, it may appear to differ therefrom only in consistency or it may acquire, in addition to a softer consistency, an easily noticeable difference in structure. The extent of such changes is dependent on the properties of the soaps and/or additives present in the greases. In other words, impressions based on the appearance of the grease at room temperature and its ASTM penetration at 77 F may sometimes be misleading if the grease is to be used at temperatures which are considerably higher.

The variation of apparent viscosities with temperatures for three conventional type greases is shown in Fig. 2. On referring thereto, it will be noted that this particular aluminum stearate grease instead of becoming softer as the temperature was increased from 20 F to 130 F actually recovered consistency.[4]. Inspection of the grease during that stage would disclose that it had lost its buttery structure and had changed to a rubbery product decidely different from its condition as received. The transition stage will vary with the type of aluminum soap and characteristics of the mineral oil. Greases made with other soaps may also undergo changes in structure at elevated temperatures.

When confronted with the problem of selecting a grease for lubrication of bearings operated at elevated temperatures, the engineer will usually find it worth while to consider the following variables:

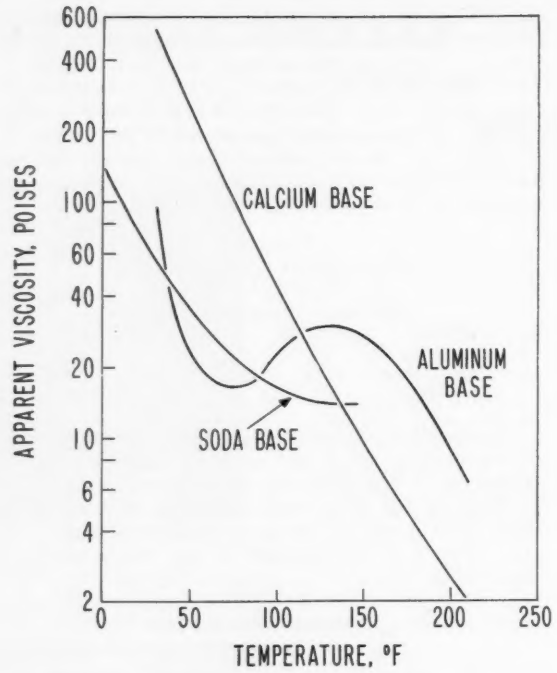

Fig. 2
Representative greases 1000 Sec-rate of shear.

1. Viscosity of Mineral Oil Component—The viscosity should be sufficiently high so that loss due to evaporation of the oil will not be excessive and will not be the cause of undesirable drying out or stiffening of the grease.
2. Consistency-Apparent Viscosity—In addition to maintaining stay-put properties at the high end and avoiding too stiff a consistency at the low end of the temperature range, allowance must be made for the tendency of certain greases to revert to their inherently stiff consistencies if heated and then permitted to cool to room temperature without working.
3. Type of Soap Base—If the temperature is over 160 F, aluminum and conventional calcium soap greases are ruled out and attention is given to sodium, barium, lithium, anhydrous calcium, certain mixed base and so-called synthetic greases.
4. Chemical Stability—There are some experimental data to indicate that every increment of 18 F cuts the life of the grease in half.[5] This rule-of-thumb figure probably varies with the particular grease and combination of additives. In any case, the rate of chemical reaction is definitely increased with increases of temperature. It follows that after the rate has been doubled a number of times, the life of the grease may become so shortened that it will not meet previous requirements.
5. Dropping Point — This figure is often given more significance than was originally intended or permitted by ASTM's definition of the test. Actually, the spread between dropping point and satisfactory operating temperature limit may be more than 100 F.[6] Its value is primarily that of a qualitative indication of the resistance of the grease to heat.

Listing the corresponding variables for greases used at low temperatures, there are the following:

1. Viscosity and Pour Point of Mineral Oil—It is usually assumed that the lower the viscosity and pour point, the better will be the low temperature properties of the grease made therewith. The extent to which this reasoning holds true is dependent on the amount of soap present. The lower the percentage of soap, the greater will be the extent to which the behavior of oil will determine the properties of the grease. It should be noted that additives may upset this generalization. For example, the addition of certain additives to improve adhesiveness may have a marked adverse effect on low temperature behavior of the grease.
2. Type of Soap Base—The main consideration here is their respective abilities to maintain stable structures and avoid excessive bleeding when used with extremely light viscosity oils.
3. Consistency-Apparent Viscosity—The importance of this factor is dependent on the starting and running torques available. For example, wheel bearing greases which become quite hard at freezing temperatures are nevertheless practical because the torques required to overcome this consistency are available and the operating temperature quickly rises due to the heat created by working the hard grease. On the other hand, a fractional horsepower motor would remain completely stalled under the same conditions and requires a product specifically designed for low temperature service.

Speed—It is generally accepted practice to avoid the use of a heavy oil when oil-lubricated bearings are operated at high speed because otherwise high bearing temperatures are created just by overcoming the fluid friction of the oil itself. The higher the rpm, the more decided the trend to either a light viscosity oil or a reduction in thickness of film of heavy oil by strict limitation on the rate of feed of the oil to the moving bearing surfaces. The same type of reasoning and experience applies to the selection of greases. More specifically, the points considered when high speeds are involved are the following:

1. Avoid greases which have high apparent viscosities as they tend to behave like heavy viscosity oils.
2. Give preference to a grease as soft or thin as can be retained by the seals, but avoid over-packing.
3. If a stiff grease must be employed, select a product which will channel and yet permit the pulling of a small amount of short-fibred grease into the bearing track.
4. Greases which will bleed oil but not excessively are preferred to those which are completely stable in that respect, because the free oil will help tide over periods when movement of the grease itself may be retarded.[7]

Load—Experience indicates that the same considerations are involved in decisions regarding prevention of metal-to-metal contacts when grease is the lubricant as when oil is employed. From this viewpoint, three general types of greases are available, i. e., straight, compounded with lead soaps and compounded with EP components. As with oils, straight greases vary in the subject respect. In so far as bearing wear may be prevented by use of the proper viscosities, the extent of this variation is indicated by comparing their apparent viscosities at the same rates of shear and temperature. It should be recognized that the lubricating film of stable grease is not composed of only the mineral oil compo-

nent but that the soap is also present in the film and it effectively assists in carrying the loads. There is also a place for greases which have their load-carrying ability increased by the addition of fillers or materials such as graphite, although there is reason to believe that due to the presence of soap the benefit derived from graphite, etc., is apt to be less than when added to oil. Moreover, there is the hazard that the particles of filler will not remain dispersed according to plan but instead they may conglomerate and form comparatively large sized aggregates which may be hard, abrasive and in the case of anti-friction bearings particularly, seriously interfere with free rotation of the balls or rollers.

Frequency of Application—Frequency of application is a factor the importance of which is sometimes not fully appreciated. It determines the length of time to which the grease will be exposed to deteriorating effects. It, therefore, determines the required level of chemical stability and ability to consistently maintain an adequate lubricating film on the bearing surfaces. For example, two greases as received may have equally satisfactory abilities to stay put at high temperatures but if the intervals between additions of new grease differ widely, one of the products may be much more satisfactory than the other if it has appreciably higher chemical stability. To attain that higher quality today, specific additives are employed as well as the highest grade materials free from contamination such as iron rust which act as oxidation promoters. However, both of these high temperature greases may give satisfactory performance if new grease is charged with proper frequency and provided, of course, bearing design permits displacement of used grease with new grease.

Requests are occasionally received for greases which will withstand temperatures closely approaching or exceeding their dropping points, i. e., temperatures where the greases are fluid. A number of cases could be cited where greases are nevertheless successfully used at such temperatures because applications are sufficiently frequent. Instead of charging a large amount of grease, most of which will quickly throw out, relatively small amounts of grease are automatically applied at short, regularly spaced time intervals.

Contaminants—Water is the contaminant most frequently encountered in the field. The statement that a grease is resistant to water is often loosely made when describing the properties which a lubricating grease should have in order to give satisfactory performance where exposure to water will occur. It is true that the ability of the grease to resist washout from the bearings and its corrosion-prevention characteristics are both related to water-resistance properties, but confusion in recommendations may be avoided if recognition is given to the fact that the grease which resists washout best may not also satisfactorily protect the bearings from serious rusting.[8] For both of these requirements it is not unusual to find that recommendations are based primarily on the metallic radical of the soap component of the grease. Calcium, aluminum, lithium, and barium are regarded as inherently resistant to water, while sodium is avoided where that characteristic is desired. Actually, selection of greases on that basis will not consistently assure satisfactory products, because experience has demonstrated that other components of the lubricants may possibly have equal or more important effects.

Data obtained from laboratory evaluations of the above mentioned types, but particularly experience in the field, have indicated that the ability of greases to resist washout from bearings operated under service conditions is dependent on the following factors:

1. Metallic component of soap (calcium, sodium, etc.).
2. Fatty component of soap (oleate, stearate, etc.).
3. Mineral oil (viscosity, degree of refinement, etc.).
4. Reaction of finished grease (free acid or alkali).
5. Additives (rust and oxidation inhibitors, etc.).
6. Bearing design (sealed, open, etc.).
7. Operating conditions (temperature, frequency of application of grease, etc.).

As an indication of the extent to which the above factors will influence the resistance of the grease to wash out from bearings, data are tabulated in Table V, obtained from a series of tests run in accordance with the procedure described in detail in Army-Navy Aeronautical Specification AN-G-5a.[9]

It has been generally recognized that to satisfy both requirements, i. e., resistance to wash-out and rust protection, some of the former properties have to be sacrificed in order to encourage emulsification of the water and so create conditions favorable for the latter. Emulsification, as illustrated by the sodium oleate grease included on Table V is, of course, excessive and will lead to rapid loss of the lubricant from the bearings. Incidentally, rusting is sometimes confused with fretting corrosion because both result in the formation of iron oxide and the origin thereof may not be evident without careful inspection.

TABLE V

EFFECT OF METALLIC AND ORGANIC COMPONENTS OF SOAPS AND VISCOSITY OF MINERAL OIL ON WATER RESISTANCE OF GREASES

Soap Base	Mineral Oil, S.U. Viscosity at 100 F	AN-G-5a Procedure Grease Loss, %
Calcium Stearate	100	Nil
Lithium Stearate	100	3
Aluminum Stearate	100	Nil
Sodium Oleate	100	90
Sodium Stearate	100	25
Sodium Stearate	1000	20
Sodium Stearate	3000	8

Regardless of the nature of the contaminant, i. e., water, dirt, acids, fibres, etc., it may be advisable to select a grease which will help form a protective seal for the bearings and to apply new grease as frequently as may be necessary to maintain that seal, or if conditions are such that this procedure is not practical, the greasing periods should be spaced as required to provide adequate flushing of contaminated grease from the bearings with new grease.

To a certain extent, residues from previous charges are contaminants for new grease, particularly if they are from different products. The principles which are widely followed to avoid contamination while changing batches of lubricating oils, particularly if they contain additives, also pertain to greases. A new grease represents the outcome of development of formulae which specify definite percentages of each component to obtain desired performance characteristics. Moreover, it has been manufactured under controls which include observance of precautions to avoid contamination which would adversely affect those properties. It is, therefore, reasonable to expect that the admixture thereto, while in the bearings, of greases of widely different composition will seldom result in an improved formulation or even as satisfactory a formula as that represented by the unused grease. However, this type of contamination must usually be tolerated because precleaning of the bearings before changing source of grease is frequently impractical. Nevertheless these comments apply to the problem and allowance should be made for the probability that

the mixing of used and new grease of different composition may result in a decrease in the lubricating value of the latter.

Bearing Design—As a guide to grease recommendation, bearing design is a factor to the extent that it affects control of the amount of grease fed to the moving bearing surfaces. For example, ball bearings located in motors operated with the shaft in a vertical position are usually more difficult to satisfy than the corresponding bearings in motors placed in a horizontal position. Ball bearings fitted with double seals may require a different product than that used with no seals, if maximum performance is desired.

It is well known that the operating temperature of a fully packed ball bearing will run high until sufficient leakage has occurred to create ample working space for rotation of balls, or until the bulk of the grease has been moved to a point where it is not continually worked and until the excess volume of the grease pack is forced past the seals and drain or relief plug openings.

The effect of the amount of grease packed into an 80 mm OD cartridge type ball bearing operated at about 3450 rpm is indicated by Fig. 3.[10]

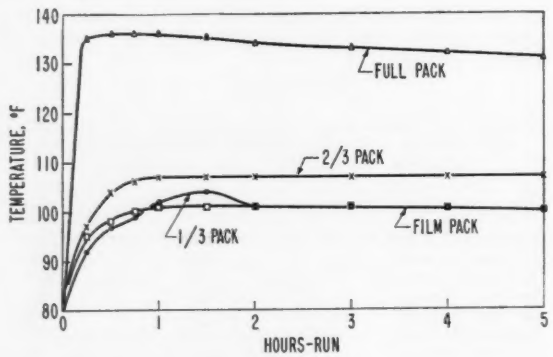

Fig. 3
Size of grease pack vs. temperature F.

In another series of tests, the operating temperatures of full, two-thirds, one-third, and film packs rose to 155 F, 140 F, 100 F, and 95 F, respectively, within one hour. Within ten hours of operation, these temperatures had decreased to 105 F, 105 F, 98 F, and 95 F, respectively. The data from these two series of laboratory tests are in line with experience in the field. The more resistant the grease is to break-down on working, the more decided will be the trend toward high operating temperatures if the bearings are packed full. Aeration which usually accompanies generation of high bearing temperatures due to overpacking, also promotes leakage and breakage of seals as well as oxidation of the lubricant.[11] Because it is difficult or impossible to avoid overpacking in certain housings, provision should be made for relief of the excess volume of grease. If prepacked bearings are adopted as the alternative, only premium grades of grease should be applied and a schedule should be established for sufficient dismantling of the equipment periodically for at least inspection of the condition of the grease. The length of the time intervals between inspections is dependent not only on the particular grease employed but also on the severity of the operating conditions.

Summary

Utilization of the wide range of properties of currently available greases is dependent on the meshing of the requirements of the bearings with knowledge of the performance characteristics of those greases. Selection of the proper product is assisted by recognition of the fundamental considerations involved. The information presented above has been presented in generalized outline form with the intention of making it broadly applicable to the wide variation of conditions confronting many lubrication engineers.

References

(1) Separability Characteristics of Lubricating Greases, by T. G. Roehner and R. C. Robinson, The National Lubricating Grease Institute Spokesman, 9, No. 2 (1945).
(2) Proposed Method of Test for Apparent Viscosity of Lubricating Grease, ASTM Standards on Petroleum Products, Nov. 1949 issue.
(3) Flow Characteristics of Lubricating Greases, by A. Beerbower, L. W. Sproule, J. B. Patberg and J. C. Zimmer, The National Lubricating Grease Institute Spokesman, 6, No. 8 and No. 9 (1942), No. 10 and No. 11 (1943).
(4) The Effect of Soap Structures on Apparent Viscosities of Lubricating Greases, by T. G. Roehner and R. C. Robinson, The National Lubricating Grease Institute Spokesman, 10, No. 12 (1947).
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(9) Evalution of Water Resistance Properties of Lubricating Greases, by T. G. Roehner and E. S. Carmichael, National Lubricating Grease Institute Spokesman, XI, No. 6 (1947).
(10) Characteristics of Greases as Related to Anti-Friction Bearing Applications, by E. S. Carmichael and R. C. Robinson, Mechanical Engineering, February (1950).
(11) Service Experience with Grease, by W. T. Everitt and C. L. Pope, ASTM Symposium, Special Technical Publication No. 84.

WANTED

Lubrication Engineer

Nationally known manufacturer of Lubrication Equipment located in the middle west has opening for experienced Lubrication Engineer. He will take charge of plant lubrication, supervise installation of centralized automatic lubrication systems in own plant and assist engineering staff in field application of lubrication systems. Will also handle cutting fluids and coolants of large screw machine department and similar equipment in other departments.

Please give complete information and salary desired in first letter which will be held strictly confidential.

Box No. 713

Lubrication Engineering, 343 S. Dearborn St.

Chicago 4, Ill.

NEW PRODUCTS and EQUIPMENT

Electric Powerguns: Alemite Div., Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill. — Two new design high pressure electric powerguns, of 25 lb. and 40 lb. capacity, for use where air power is not available, have been announced.

It is said they handle all greases that seek their own level and develop 5,000 psi. The motor automatically shuts off when 5,000 psi is reached.

The 40 lb. gun, Model 7175-R, handles all types of grease; fibrous, heavy or light. It has helix arm and worm gear priming, and delivers 5½ oz. of heavy fibrous lubricant per minute at 70 F.

Both models are available with 8 in. rear and 4 in. front wheels, of steel or rubber.

Multiple Oiler: Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis. —A centralized system of lubricating 1 to 20 bearing points, fed from a large reservoir through individually adjustable needle-valves and copper or Neoprene tubing to the various lubrication points, is announced. A solenoid control located directly below the reservoir furnishes positive feed. Sight feed fittings indicate the amount of oil being fed to the bearings.

Complete descriptive bulletin available free.

Colloidal Graphite: Acheson Colloids Corp., Port Huron, Mich. — At 1000 F and up, in which range many types of baking, annealing and drying ovens operate, the problem of lasting lubrication is a trying one.

The use of "dag*" colloidal graphite dispersion is claimed to have eliminated lubrication difficulties on conveyor chains running in ovens in the above range of temperatures.

* Registered Trade Name

Lubricator: Acro Metal Stamping Co., 326 E. Reservoir Ave., Milwaukee 12, Wis. — Introducing a new improvement on this company's line of constant level lubricators. As an additional safeguard against faulty lubrication, oil level windows have been installed on their 4, 8, 16 and 32 oz. lubricators.

The oil level in the lower assembly is visible at all times, serving as a check on lubricant flow to bearings.

It is said to be particularly adaptable to electric motors as a guard against overoiling. No adjustments necessary after installation.

Complete information on request.

New Lubrigun: Lincoln Engineering Co., 5743 Natural Bridge Ave., St. Louis 20, Mo. — Announcement is made of a new electric Lubrigun*, Model 249, with pressure primer for dispensing medium and heavy grade lubricants.

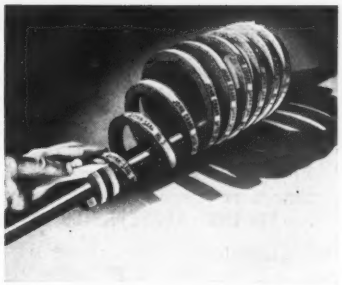
These sturdily constructed Lubriguns are specifically designed and built to provide fast, efficient lubrication of industrial machinery requiring high pressure application of medium and heavy grade lubricants that will not readily seek their own level.

The units are equipped with a manually-operated screw-feed pressure primer, spring loaded to maintain positive and continuous prime even at low temperatures.

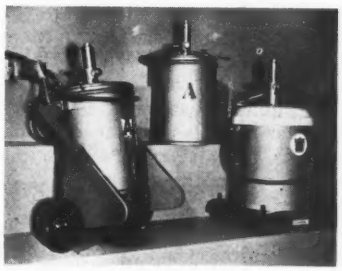
For additional information, write for Bulletin 662.

* Registered Trade Name

"Super Seal" Packing: Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill. — Announcement is made of a new securely-vulcanized tape backing that gives greater flexibility, extra economies, and easier identification—now a feature of all John Crane "Super Seal" plastic packings. By increasing flexibility, the new backing allows packing spirals to be twisted down to small shaft sizes and then cut into rings without breakage. Identification of "Super Seal" is simpler with the new tape-back, since each style of packing is clearly marked in a different color.



Write the manufacturer, Dept. F-14, for free booklet giving detailed information.



New Air Pumps: Alemite Div., Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill. — Three models of an air-operated high pressure lubricant pump, the Alemite "Seven Eleven," which will deliver lubricant from 25, 35 or 50 lb. original containers, have been announced by the above company.

The heart of the 711 pumps is a radically new sealed-in air motor which the company advises is unconditionally guaranteed for 27 months. The motor requires no oiling and has an exclusive centered-valve design, with the air valve and related parts located between the air cylinder and pump tube. The pump has a minimum of moving parts, and is both light and compact. It weighs only 9 lbs. There is no trip rod nor cam and the motor is impossible to stall, according to Alemite engineers.

Models 711 and 711-A are both portable with moving bases. Model 711-B is a stationary unit without base or dolly.

(*Continued on page* 232)

NEWS OF THE SECTIONS

SECTION SECRETARIES

With the close of the summer season, all Sections will again be resuming their monthly meetings. May we urge the Section Secretaries to send to the National office their plans for the winter season. Material must be received no later than the 10th of the month prior to publication; earlier whenever possible.

NEW CLASSIFICATION

The Board of Directors, at a recent meeting, voted to establish a new membership classification under the heading "Sectional Sustaining Members." The resolution unanimously passed reads as follows:

"Sectional Sustaining Members shall be such persons or organizations as may be interested in and desire to contribute regularly to the support of the purposes and activities of a local Section of the Society. A Sectional Sustaining Member shall designate as his official representative a person having the qualifications specified in Section 2A of this Article and who will exercise all the rights and privileges of membership in the Society."

Explanatory Note: Section 2A of this Article covers requirement for regular membership.

The annual fee is $25.00. The officers of the Sections have detailed information.

SECTION MEETINGS

As we go to press, arrangements for the fall and winter season of the various Sections have not yet been finalized. We list below a partial schedule of the speakers and the cities in which they will appear, according to the information we have in the National headquarters:

Mr. D. F. Hollingsworth—

Buffalo	Sept. 20th
Pittsburgh	Oct. 20th
Los Angeles	Nov. 7th
San Francisco	Nov. 8th
St. Louis	Mar. 20th

Mr. C. L. Pope—

Dayton	Sept. 26th

FORT WAYNE

This Section was organized in August, 1948, and is showing a nice increase in membership as reported by Mr. J. W. (Bill) Buckner, lubrication engineer of General Electric Co., Fort Wayne Works and chairman of the A.S.L.E. Fort Wayne Section.

This group was organized through the efforts of the National Secretary and four Fort Wayne lubrication engineers: Noble Schell of International Harvester, J. W. Buckner of General Electric, Paul E. Bundy of Salisbury Axle and James Mitchell of Shell Oil.

At their first meeting in 1948, 26 attended. This number has been doubled at their meetings the past season. During the membership drive last winter, Fort Wayne was pitted against Pittsburgh and won by obtaining a 35% increase in membership.

Much interest and increased attendance was obtained by holding their meetings at various Fort Wayne industrial plants during the 1949-50 season, with plant tours following the meetings. A continuation of this plan is scheduled.

Fort Wayne was among the first 15 industrial cities in the United States to organize an A.S.L.E. Section and Chairman Buckner stated that he has placed every member on some committee to carry out some phase of activity. At the October meeting, members will outline the lubrication subjects and problems they would like covered.

(Our appreciation to Chairman Buckner for the above story on the Fort Wayne Section—its past, present and future.)

PHILADELPHIA

Dr. Edgar S. Ross submits for your interest the following personnel news relating to the 1951 Philadelphia National Convention Committee:

"Mr. William P. Kuebler, Manager Chemical Section, Metallurgical Engineering Division, South Philadelphia Works, Westinghouse Electric Corp., Philadelphia, has found it necessary to resign as chairman of the above committee, due to ill health. He will, however, continue on in an advisory capacity. It has been necessary for 'Bill' to curtail his many activities in the A.C.S., the A.S.T.M. (where he serves as chairman of the Rusting Sub-Committee studying Turbine Oils), and especially in A.S.L.E. Mr. Kuebler has served two full terms as chairman of the Philadelphia Section and has worked constantly for the further development and growth of his Section and the National as well. After a beneficial rest period following his illness, Mr. Kuebler is back on the job and his many friends wish him continued good health.

"Mr. Charles H. Foster, Industrial Products Dept., Atlantic Refining Co., Philadelphia, was selected by the Executive Committee of the Philadelphia Section to succeed Bill Kuebler as chairman of the Convention Committee. 'Charlie' was acting as chairman of the Publicity Committee, and with that background, is well qualified to take over on very short notice. He is another one of the hard working members of the Section and will ably continue the work already under way for a very successful 1951 Convention.

"Dr. Edgar S. Ross, Special Technical Representative, Sun Oil Co., Philadelphia, has been an active member of A.S.L.E. since its early organization days. He is a past National Officer and the first chairman of the Philadelphia Section. He succeeds Mr. Foster as chairman of the Publicity Committee. 'Doc's' experience in technical Society activities should prove very useful in the promotion of suitable publicity for the 1951 A.S.L.E. Convention and adds yet another veteran of the Philadelphia Section's 'Convention ball team'."

Editor's Note: The work that is being done by the 1951 National Convention Committee assures the A.S.L.E. of an outstanding Convention and Exhibit next April.

CLEVELAND

Mr. Warren H. Bruns is the newly appointed secretary of the above Sec-

tion, replacing Mr. O. J. Riss. Mr. Riss' resignation was necessary because of his transfer to Fort Wayne. His work with the Cleveland group was outstanding and Fort Wayne will welcome the experience and capability for hard work that Mr. Riss will bring to that Section. Mr. Bruns will ably fill his new position.

Mr. Robert A. Pejeau of the Diesel Engine Division, GMC, has assumed duties as membership chairman of the above Section. Considerable increase in membership is anticipated and plans are already being made for the 1952 A.S.L.E. National Convention which will be held in Cleveland.

CINCINNATI

Mr. W. D. Whalen, Plant Engineer, R. K. LeBlond Machine Tool Co. and Chairman of the Cincinnati Section News Committee, submitted the following report:

"The first regular fall meeting of this Section was held on Sept. 5th at the University of Cincinnati. Following a short business session, Mr. R. F. McKibben, Chief Lubrication Engineer for the National Cash Register Co. plants located in Dayton, discussed 'Control of Industrial Hydraulic Oil.' Mr. McKibben pointed out the need for a control system. Some of the reasons given were as follows:

1. Hydraulic systems of production machines are quite frequently very intricate and complicated.
2. Machines are being made larger, more automatic and faster in their operation.
3. A production machine is an investment and as such, should have care and protection. Production time lost, due to repair or replacement of parts reduces the return on the investment in that machine.

"A control program was adopted by the National Cash Register Co. in 1942, and consisted of making a thorough study of the lubrication requirements of the individual machines. A detailed lubrication instruction card was then made for each machine and a periodic examination schedule was set up. Mr. McKibben pointed out that the inspection schedule should be set up on a tentative basis at first and should be flexible because experience has shown that some machines, even of the same make and type, will require more frequent inspection than others. On an average, hydraulic oil checks are made every six months. At this time, a sample of the oil is taken from each machine and sent to the research laboratory for the following checks:

1. Viscosity.
2. Neutralization number.
3. Water, dirt or contamination, etc.
4. General appearance and odor.

"The National Cash Register Co. has a data sheet for each machine on which the date and result of each periodic check is entered.

"Mr. McKibben then discussed the reasons for, and the standards adopted for deciding when to change the hydraulic oil in a system. They have adopted the following points as a standard for indicating that the hydraulic fluid is breaking down and should be changed:

1. When there is a change in the viscosity of plus or minus 10%.
2. When the neutralization number reaches .25.
3. When the appearance or odor of the oil indicates that it contains dirt, water or other foreign liquids.

"All withdrawn oil is sent to the manufacturing laboratory where it is centrifuged and reclaimed. Samples are then sent to the research laboratory for checking and if the reclaimed oil meets the original specifications, it is returned to stock for re-use.

"The National Cash Register Co. program covers over 350 machines and Mr. McKibben pointed out that the machine repair department records indicate that repair work and production time lost on machines has been very materially reduced since this program was initiated. The savings in production time and repair work far offsets the cost of the control system."

ST. LOUIS

The fall season was officially opened with a meeting on Sept. 19th. Mr. W. H. Oldacre, President of the D. A. Stuart Oil Co. of Chicago, spoke on "Cutting Fluids for 1950." His talk dealt with the mechanism of chip formation, the action of cutting fluids and the application of the present knowledge of these subjects to the increasing of machine tool efficiency and output. Mr. Oldacre is a noted authority in his field and has published many papers on the subjects of cutting fluids and metal working problems.

On. Oct. 26th, Dr. E. M. Kipp, Chief, Lubricants Division of the Aluminum Research Laboratories and a past president of A.S.L.E., will speak on the subject "The Lubrication Engineer in Industry." This will be a joint meeting with the A.S.M.E. local Section and the Engineers' Club of St. Louis to be held at the Engineers' Club, 4359 Lindell Blvd., St. Louis. Dr. Kipp, through his past experience, is particularly well qualified to discuss this subject. This should prove to be one of the outstanding meetings of the season.

All meetings of this Section, unless otherwise announced, will be held the third Tuesday of the month at Garavelli's, DeGiverville and DeBalivere Sts., St. Louis. Cordial invitation to dinners served at 6:30 p.m. and/or meetings beginning at 8:00 p.m. is extended by Chairman Wulfert.

YOUNGSTOWN

Secretary M. C. Jones advises that the regular monthly meetings of this Section have been changed to the second Thursday of each month.

The season opened with a joint meeting with the Cleveland Section, which consisted of a golf party and a clam bake.

Oct. 12th — This meeting will cover various petroleum tests, including actual testing of extreme pressure lubricants on the Timken testing machine.

INDIANAPOLIS

Mr. H. E. Nicholson, program chairman of this Section, reports that the opening meeting of the fall and winter season consisted of a smoker and general social get-together held in September. A representative of The Texas Company is scheduled as speaker at their October meeting.

NEW YORK

Chairman E. M. May informs us that the Program Committee of his Section, under the chairmanship of Mr. Roy Tonning, Lubrication Engineer of the American Can Co., is working on a very attractive and interesting program for their meetings which will be held monthly beginning in September and continuing through May. The first meeting was held on Thursday, Sept. 14th.

The entire series—educational in nature — will cover the subject of lubrication.

PITTSBURGH

Mr. R. C. Cibella of the Hagan Corp. discussed the subject "Pittsburgh Meets the Challenge" at the opening September meeting of this Section. Mr. Cibella is the civic salesman for the Chamber of Commerce and is well qualified to discuss this pertinent topic.

CURRENT LITERATURE

Aeronautical Engineering Review, Vol. 9, No. 5, May, 1950

LUBRICATION OF METAL SURFACES BY SILICONE FILMS

Gregory, J. N., and Newing, M. J.—p. 60 (Australian Journal of Scientific Research, Series A, Physical Sciences, Vol. 1, No. 1, March, 1948, pp. 85-97)

Methods for the preparation of mono-, di- and tri-isoamyl chlorsilanes, and the monocetyl chlorsilane have been developed. Molecular layers of the mono- and diethyl and mono-and di-isoamyl silicones on various metal surfaces have been tested for their boundary lubricating properties. The layers have been shown to be excellent lubricants, with unusual thermal stability and resistance to wear.

COMPARATIVE FOAMING CHARACTERISTICS OF AERONAUTICAL LUBRICATING OILS

Woods, W. W., and Robinson, J. V.—p. 60 (U.S., N.A.C.A., Technical Note No. 2031, February 1950. 18 pp., illus., 1 reference)

VARIATION WITH TEMPERATURE OF SURFACE TENSION OF LUBRICATING OILS.

Ross., S.—p. 60 (U.S., N.A.C.A., Technical Note No. 2030, February, 1950. 14 pp., illus., 6 references)

FOAMING OF MIXTURES OF PURE HYDROCARBONS

Robinson, J. V., and Woods, W. W.—p. 60 (U.S., N.A.C.A., Technical Note No. 2032, February, 1950. 19 pp., illus., 3 references)

RISE OF AIR BUBBLES IN AIRCRAFT LUBRICATING OILS

Robinson, J. V.—p. 60 (U.S., N.A.C.A., Technical Note No. 2033, February, 1950. 24 pp., illus., 4 references)

LUBRICANTS FOR AVIATION GAS TURBINES

Windebank, C. S.—p. 60 (Esso Air World, Vol. 2, No. 4, January, 1950. pp. 90-94, illus.)

Vol. 9, No. 6, June, 1950

THE HYDRODYNAMICAL THEORY OF FILM LUBRICATION

W. F. Cope—p. 48 (Royal Society of London, Proceedings, Series A, Mathematical and Physical Sciences, Vol. 197, No. 1049, June 7, 1949. pp. 201-217, illus., 13 references)

Equations of film lubrication which are derived from the general equations of hydrodynamics, assuming that only steady motion takes place between two surfaces that are close together, nearly parallel, and in relative motion, show the relative magnitude of the various terms under typical conditions measured in a bearing, to be of such unequal orders that the inertia term in the momentum equation and the dialation and conductivity terms in the energy equation can be neglected.

Film lubrication is possible only if either the distance between the surfaces decreases in the direction of motion (the geometric wedge), or the density of the fluid decreases in the same direction (the thermal wedge). When compared on a basis of equal film thickness and equal decrease, both films are approximately equal. Although with the geometric wedge a much greater decrease and, therefore, load-carrying capacity is possible, the thermal wedge, because of its simpler mechanical construction, should be able to run with a thinner film.

Diesel Progress, Vol. 16, No. 6, June, 1950

LUBRICATING OIL. SELECTION—OIL TERMS—ADDITIVES

Smith, H. G.—pp. 64-65

The selection of the proper lubricating oil for various pieces of equipment is discussed. Viscosity, flash, carbon residue, acidity, color, lubricity or oiliness, additives, oxidation, corrosion resistance, the paraffin, naphthenic or asphaltum base are of importance, but none of these can be determined by any simple tests. The article gives purely practical advices for solving the problem of selecting oil.

Esso Oilways, Vol. 16, No. 12, June, 1950

TENACIOUS LUBRICANT

Anon.—pp. 12-14

A description of an unusual type of grease lubricant, Arapen, available in 2 consistency grades. Developed particularly for machine elements with intermittent motion, Arapen adheres tenaciously to moving parts. Arapens are calcium soap greases; they have excellent water resistance.

The Institute Spokesman, Vol. 14, No. 3, June, 1950

PERFORMANCE OF SILICONE GREASES

Currie, C. C.—pp. 10-17

The usefulness of silicone greases in bearings operating at extremely high and low temperatures has been established by laboratory testing and by performance under actual service conditions. Some of the results obtained with these greases in various industrial applications are reported in this paper. There are four silicone greases now available in commercial quantity. A brief description of these four greases and their fields of major usefulness are given in Table 1.

BIBLIOGRAPHY ON PETROLEUM PRODUCTS

Winn, S. E.—pp. 24-28

Journal of the Institute of Petroleum, Vol. 36, No. 317, May, 1950

LOAD CAPACITY RATING OF LUBRICANTS

Brix, V. H.—pp. 295-302

It has always been difficult to rate lubricants in terms of their ability to lubricate. This property is usually expressed as the load capacity, film strength, etc., as determined on some arbitrary test machine.

Vol. 36, No. 318, June, 1950

THE IMPORTANCE OF SURFACE OXIDE FILMS IN THE FRICTION AND LUBRICATION OF METALS. I. THE DRY FRICTION OF SURFACES FRESHLY EXPOSED TO AIR. II. THE FORMATION OF LUBRICATING FILMS ON METAL SURFACES.

Tingle, E. D.—p. 262A (Trans. Faraday Soc., Vol. 46, 1950. pp. 93-102.

Lubrication (The Texas Company), Vol. 36, No. 6, June, 1950

VISCOSITY. PART III—TURBULENCE

Anon.—pp. 61-63

The preceding discussion on the flow of viscous fluids was limited to streamline flow, in which the fluid flows as in a series of parallel or concentric surfaces having relative velocity, but no intermingling or mixing between one and another. This discussion is now expanded to include turbulent flow which follows when fluid velocity is sufficiently increased.

Lubrication Engineering, Vol. 6, No. 3, June, 1950

MULTI-FUNCTIONAL LUBRICANTS

Kipp, E. M.—pp. 112-116

At one extreme, we may postulate that when the ultimate in knowledge is attained, it will be possible to design an all-purpose multi-functional lubricant in such an ingenious and effective manner that this lubricant will be found to provide whatever properties may be required. An opposite and perhaps equally extreme approach would be to consider each individual machine element and a given set of associated conditions of operation such as temperatures, speeds, loads, and the like as a specific problem of lubrication unique unto itself. The conditions most likely to prevail on the basis of practical realities will represent a happy medium between the two extremes outlined. The article takes up: viscosity, stability characteristics, extreme pressure type lubricants. An uninformed consumer will be unable to utilize most effectively the knowledge and know-how built into the various lubricant products by the manufacturer of lubricants. Multifunctional lubricants tend to provide a safety feature in this regard. The development and use of the most versatile lubricants possible would be of value in meeting the requirements involved. Variations in operating conditions representing a given application are pertinent. They may represent variations of greater magnitude than the significant differences in a series of oils which might be under consideration. Closeness of control of operating conditions has a logical relationship to the consideration of the use of multi-functional lubricants. Results obtained on laboratory machines which initially seemed to be highly contradictory, and bearing little practical relation to production conditions, actually make sense when interpreted in the light of later knowledge. Initial cost of lubricant is not necessarily a reliable over-all criterion. Loss of a single complicated heavy duty machine element will pay for many thousands of gallons of oil.

APPLICATION OF WEAR RESISTANT PHOSPHATE COATINGS TO FERROUS SURFACES

Roosa, M. B.—pp. 117-121

In approximately 1940, Parco Lubrite was introduced to industry as a wear resistant product for use on ferrous surfaces. Parco Lubrite is a registered trade mark of the Parker Rust Proof Co. The treatment forms a chemical layer of an inert phosphate coating between surfaces, acting as an antiflux. It increases lubrication efficiency, assures rapid, safe break-in, removes chemically any irregularities occurring from machining operations. This treatment, when applied to ferrous metals, provides a non-welding medium which assures greater lubrication efficiency, and safe brake-in of bearing or sliding surfaces.

OILS AND LUBRICANTS PATENT ABSTRACTS

Printed copies of patents are available from the Patent Office at twenty-five cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents.

From Official Gazette—Vol. 636, Nos. 1, 2, 3, 4; Vol. 637, Nos. 1, 2, 3, 4, 5.

Prepared by ANN BURCHICK

Lime Base Grease — Patent #2,513,680 — John E. Schott and Eldon L. Armstrong, assignors to Socony-Vacuum Oil Co., Inc.

An improved lime base grease composition characterized by stability at temperatures in excess of 200 C. and by improved storage stability, comprising lubricating oil, lime soaps of fatty acids in grease forming amounts, a small proportion, sufficient to impart said temperature stability, of a calcium salt of a monocarboxylic fatty acid having not more than six carbon atoms, and a small proportion, sufficient to impart said storage stability, of a lime salt of phosphoric acid, phosphoric acid having been present in the formulation of said grease in amounts of at least about 0.1 weight per cent and not exceeding about 2 weight per cent of the grease formula.

Lubricating Grease and Method of Preparing Same — Patent #2,514,286—Arnold J. Morway, assignor to Standard Oil Development Co.

A lubricating composition which is normally relatively liquid and mobile and which has the property of setting up to a solid grease consistency upon being subjected to mechanical working, said composition consisting essentially of a mineral lubricating oil containing grease-forming proportions of a soap-salt thickener prepared by mixing about one molar proportion of fatty acid of the C_{16} to C_{22} range, at least one-half molar proportion of C_2 to C_4 fatty acid, and an alkali metal hydroxide into said oil, heating said mixture with continued stirring to a temperature of at least 450 F. to obtain a fine dispersion of said soap-salt in said oil, cooling with stirring to a temperature range of about 200 to 250 F., and thereafter permitting the composition to cool without further working.

Solvent Resistant Low Temperature Lubricant—Patent #2 514,296—Augustus B. Small and Robert M. Thomas, assignors to Standard Oil Development Co.

A lubricating composition resistant to hydrocarbon solvents consisting essentially of 40 to 90% by weight of a polyhydric alcohol having lubricating properties, said alcohol being selected from the group which consists of glycerine, C_2 to C_4 glycols and the lower monoalkyl ethers thereof which have freezing points below 0 C., combined with enough water to substantially increase fluidity of said alcohol below a temperature of about—100 F., 10 to 60% of zinc stearate, and 0.01 to 5% of a sulfonate type wetting agent which has a greater affinity for the surfaces being lubricated than said solvents to maintain dispersion of said stearate in said alcohol and water.

Process of Manufacturing an Aluminum Base Grease—Patent #2,514,311—Austin E. Calkins and Ralph Darley and Alan Beerbower, assignors to Standard Oil Development Co.

The process of preparing stable aluminum base lubricating greases of smooth texture which comprises combining about 62% by weight of unfinished Venezuelan distillate mineral oil of lubricating oil viscosity and containing about 1% to 1.5% by weight of polar compounds including phenols, naphthenic acids, and acid-phenol substituted aromatic compounds with about 32% of finished Coastal oil as a diluent and about 6% of aluminum soap of substantially saturated fatty acids within the range of 12 to 22 carbon atoms as a thickener, heating the mixture to a temperature of above 300 F. and not higher than about 350 F., and thereafter rapidly cooling below about 100 F. in thin layers, accompanied by mechanical working.

Mixed Base Lubricating Greases—Patent #2,514 330—Arnold J. Morway and Rosemary O' Halloran, assignors to Standard Oil Development Co.

An anti-friction bearing lubricating grease consisting essentially of a mineral base lubricating oil having a viscosity index of at least 80 thickened to a grease consistency with a mixed sodium-barium soap of fatty acid having an average of less than 18 carbon atoms, wherein the molar ratio of soda soap to barium soap is between 1 to 1 and 30 to 1, said grease containing a slight excess of said fatty acid sufficient to give a free acidity of 0.01 to 0.5% by weight calculated as free oleic acid.

Stabilized Lubricating Grease—Patent #2,-514,331—Arnold J. Morway, assignor to Standard Oil Development Co.

A substantially solid grease type lubricating composition consisting essentially of a mineral base lubricant of grease consistency, said lubricant containing 0.2 to 15% by weight, based on the total composition of finely divided silica having an average particle size of not more than 100 millimicrons, said composition including 2.8 to 40% of alkaline earth metal soap and having water resistant properties.

Process for Resolving Emulsions—Patent #2,514,399 — Willard H. Kirkpatrick and Loyne L. Wilson, assignors to Visco Products Co.

A process for the resolution of oil-in-water emulsions which comprises subjecting an oil-in-water emulsion to the action of a water dispersible product of the reaction of a polyalkylene glycol and a substance selected from the group consisting of detergent forming acids and their esters having at least 8 carbon atoms in an aliphatic carbon chain reacted with the elimination of water at temperatures within the range of 150 C. to 210 C. in relative proportions equivalent to at least 1 mol of acid per mol of glycol but less than the amount theoretically required to completely esterify all of the hydroxyl groups in the polyalkylene glycol.

Lubricating Oil Composition—Patent #2,-514,625—Theodore I. Clausen and John T. Rutherford, assignors to California Research Corp.

A lubricating oil comprising a major amount of an oxidizable lubricating oil and a small amount, sufficient to inhibit substantially said oxidative deterioration, of the aliphatic sulfur-containing reaction product produced by heating an element selected from the group consisting of sulfur and selenium with a dialkyl sulfide of relatively low inhibitor activity and containing at least 14 carbon atoms in the molecule, to about 275-400 F., said product containing about 15-45% of said added element, based on the weight of sulfur present in said dialkyl sulfide before heating, said added element being stably combined with said dialkyl sulfide and exhibiting substantially no tendency to separate at 77 F., said reaction product having a greatly increased inhibitor activity as compared to said original dialkyl sulfide.

Lubricating Oil Composition Containing Pour Point Depressant—Patent #2,515,015—Eugene Lieber and Edward P. Cashman, assignors to Standard Oil Development Co.

A lubricating composition consisting essentially of a major proportion of a waxy mineral lubricating oil and a pour depressing amount of a product obtained by reacting a long chain chlorinated aliphatic compound having at least 10 carbon atoms with naphthalene in the presence of a Friedel-Crafts catalyst at a temperature of room temperature to about 200 F. and further reacting the product thus formed at about the same temperature range in the presence of a Friedel-Crafts catalyst with a phosphorus and halogen-containing compound having the empirical formula $P(Y)m(X)n$, where X is a halogen, Y is a member of the class consisting of oxygen and sulfur, m is a number from 0 to 1, and n is an odd number from 3 to 5.

Lubricant Composition—Patent #2,515,129 —Eugene Lieber and Aloysius F. Cashman, assignors to Standard Oil Development Co.

Composition consisting essentially of a waxy mineral lubricating oil having dissolved therein at least a pour depressing amount of a Friedel-Crafts condensation product of a sulfurized highly chlorinated paraffin wax with naphthalene, said condensation product having an average molecular weight of between 500 and 3000, and containing about 10 to 30% of chlorine and about 2 to 20% sulfur.

Lubricating Grease—Patent #2,515,133—Arno.d J. Morway, assignor to Standard Oil Development Co.

A lubricating grease composition having a pH value of at least 7.0 and consisting essentially of a liquid oily lubricant thickened to a grease-like consistency with 3 to 30% by weight, based on the total composition, of metal soap of aliphatic fatty material, 0.2 to 1% of a resinous, oil-soluble condensation product of diisobutyl phenol and a formaldehyde reacted with a nitrogen base, and 0.02 to 0.5% of phenyl beta-naphthylamine.

Process for Preparing Lubricating Oil Addends—Patent #2,515,281—Franklin M. Watkins, assignor to Sinclair Refining Co.

In a process for preparing a lubricating oil addend which involves subjecting a turpentine which initially includes oxygen-containing impurities to return with phosphorus pentasulfide at a temperature approximating 275 F. whereby there is produced an oil-soluble phosphorus- and sulfur-containing reaction product useful as a lubricating oil addend, the improvement comprising subjecting the turpentine including the oxygen-containing impurities prior to reaction of the turpentine with phosphorus pentasulfide, to heating at refluxing temperature in the presence of metallic sodium and then distilling the reaction product, whereby the turpentine is rendered substantially free of oxygen-containing impurities that are reactive with phosphorus pentasulfide to produce compounds which have an objectionable odor and which are thermally unstable.

Rust Inhibiting Lubricating Oil—Patent #2,515,520—William M. Leath, assignor to Tide Water Associated Oil Co.

A lubricant especially adapted for the lubrication of steam turbines for marine use, comprising essentially a mineral lubricating oil and a rust-inhibiting quantity of not less than .01% by weight of alkyl acid phosphate having from 8 to 16 carbon atoms in the alkyl group and an alkoxy aniline of the group consisting of anisidine and phenetidine, the alkoxy aniline being present in quantity of not less than three times the amount theoretically required to react with the alkyl acid phosphate, the alkoxy aniline varying in percent of weight of the oil from .05% to the limit of its solubility in the oil.

Lubricating Grease Compositions—Patent #2,516,136—Arnold J. Morway and David W. Young, assignors to Standard Oil Development Co.

A lubricating grease composition consisting essentially of lubricating oil thickened to a grease consistency with 1 to 3 molecular proportions of metal soap of higher fatty acids and 1 to 2 molecular proportions of metal salt of a heterocyclic carboxylic acid, said heterocyclic acid being a low molecular weight acid having a five-membered heterocyclic ring in which the hetero atom is selected from the group consisting of oxygen and sulfur.

High Temperature Lubricating Greases—Patent #2,516,137—Arnold J. Morway and John J. Kolfenbach, assignors to Standard Oil Development Co.

The process of preparing a lubricating grease composition for high temperature use, which comprises combining a cyclic aldehyde capable of undergoing the Cannizzaro reaction with an alkali to convert part of said aldehyde to a cyclic carboxylic acid salt and part to the corresponding alcohol, adding a saponifiable fattty material and a further quantity of alkali to form a soap and adding lubricating oil, said salt and soap being combined in proportions of 1 to 4 molar parts of said salt with 1 to 4 molar parts of said soap, said combined salt and soap serving to thicken said lubricating oil to a grease consistency.

Use of Furfural in Grease Manufacture—Patent #2,516,138—Arnold J. Morway, assignor to Standard Oil Development Co.

The process of producing soap and metal furoate lubricating grease compositions which comprises drawing an effluent liquid containing furfural directly from a furfural solvent oil treating process, adjusting the furfural content and the proportions of an added substantially saturated saponifiable fatty material, together with the lubricating oil content to grease-forming proportions, said furfural content being

(*Continued on page* 231)

WHY
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catches ferrous particles as fine as one micron and increases the life of machinery using circulating oils

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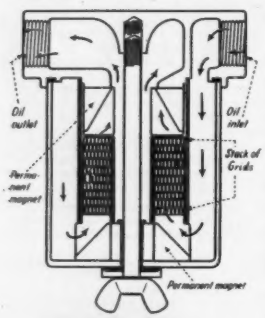

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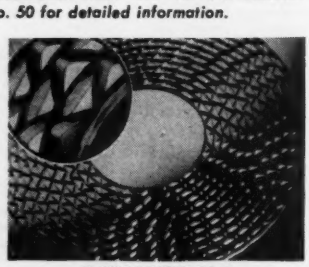

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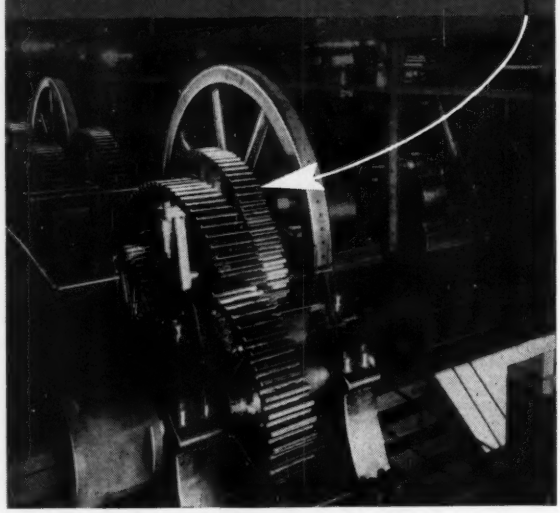

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(*Continued from page* 229)

adjusted to a range between 2 and 20% by weight, based on the total composition, and adding a sufficient quantity of a saponifying base to convert said furfural to a furoate and furfuryl alcohol and to saponify said fatty material in said oil.

Lubricating Oil Detergent—Patent #2,516,616—James O. Clayton and Dorr H. Etzler, assignors to California Research Corp.

A composition of matter consisting essentially of a major proportion of a mineral lubricating oil which is susceptible to deterioration when exposed to oxygen and, in an amount sufficient to improve the detergency of said lubricating oil a polyvalent metal salt of a selenic acid.

Antioxidants for Mineral Oil Lubricants and Compositions Containing the Same—Patent #2,516,654—Herschel G. Smith and Troy L. Cantrell and John G. Peters, assignors to Gulf Oil Corp.

The process of preparing an addition agent for mineral oil lubricants which comprises heating phenyl morpholine with from 2 to 6 mols of N-dimethylaniline and 2 to 6 mols of formaldehyde per mol of phenyl morpholine in the presence of an activated clay catalyst at a temperature not in excess of 350 F. to condense together the three reactants, and recovering the condensation product.

Soluble Oil Base—Patent #2,516,838—Knapel F. Schiermeier, assignor to Shell Development Co.

An oil base soluble in an aqueous medium adapted for use as a rust inhibitor and metal-working lubricant containing the following constituents in the following approximate proportions:

	Percent Weight
Water	11.8
Sodium hydroxide	2.4
Formalin (approx. 40% HCHO)	2.2
Glycerin	6.1
Ethylene glycol ethyl ether	5.8
Hydroxy aliphatic hydrocarbon carboxylic acid having 18 carbon atoms and not more than one double bond in the molecule	16.6
Sodium petroleum sulfonate (oil-soluble)	46.1
Extra winter strained lard oil	9.0

10% to 30% of the composite of said constituents being blended with from 70% to 90% of a liquid petroleum oil base.

Lubricant Composition — Patent #2,516,844—John D. Bartleson, assignor to The Standard Oil Co.

A lubricant comprising an oil dispersible reaction product of one mol of a hydrocarbon unsaturated non-tertiary amine containing a straight chain hydrocarbon radical having at least 12 carbon atoms and at least one olefinic double bond and at least above about 0.5 mol of phosphorus pentasulfide reacted at a temperature above 400 F. but below a temperature up to 600 F. at which the reaction product would be decomposed.

Manufacture of Halogenated Hydrocarbon Oils—Patent #2,518,122—John D. Calfee and Charles B. Miller, assignors to Allied Chemical & Dye Corp.

A process for making halogenated hydrocarbon oils, which comprises heating difluorovinyl chloride at a temperature between 350 and 425 C. and at a pressure of at least 400 lbs. psi.

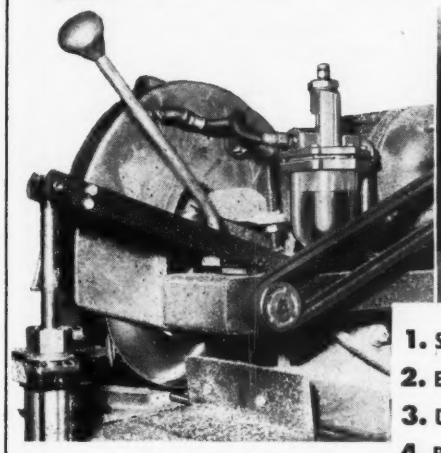
Purification of Oils—Patent #2,518,353—Art C. McKinnis, assignor to Union Oil Co. of California.

A continuous process for the separation of nitrogen bases from hydrocarbon oil solutions thereof which comprises combining a volatile base selected from the class of volatile bases consisting of ammonia and the mono-, di- and tri-methyl amines and a strong non-volatile polybasic inorganic acid in the presence of water to form an aqueous solution of the normal salt of said volatile base and said non-volatile acid, heating said aqueous solution and evaporating thereby a portion of said volatile base to form an aqueous solution of an acid salt of said volatile base and said non-volatile acid, contacting said hyprocarbon oil solution of nitrogen bases with said aqueous solution of said acid salt to form a hydrocarbon oil raffinate and an extract containing said nitrogen bases as normal nitrogen base salts, separating said raffinate from said extract, combining said extract with the evaporated portion of said volatile base thereby reforming in solution said normal salt and liberating said nitrogen bases, removing the liberated nitrogen bases and returning the solution of normal salt for reuse in the process.

Process for Producing Synthetic Lubricants—Patent #2,518,529—Roger Boux de Casson and Lucien Hemmer, assignors to Societe anonyme dite: Standard Francaise des Petroles.

An improved process for the production of a synthetic lubricant which comprises simultaneously alkylating and polymerizing about 50 parts by weight of benzene with about 200 parts by weight of a cracked distillate in the presence of about 8 parts by weight of aluminum chloride at a temperature of about 50 C. for about 5 hours in a reaction zone allowing the temperature to raise to one within a range of from 100 C. to about 110 C. for about 2 hours to obtain an alkylated polymerized reaction product, treating said reaction product with a decolorizing clay in the presence of steam, distilling said treated reaction product to separate it into a synthetic lubricating oil fraction having an iodine number of less than 10 and a light lower boiling fraction, recycling said light fraction to said reaction zone, charging to said reaction zone fresh benzene cracking distillate and aluminum chloride until there exists in said reaction zone a mixture comprising approximately 4 parts by weight of benzene, 144 parts by weight of recycled fraction, 100 parts by weight of cracking distillate and 4 parts by weight of aluminum chloride, and reacting said charged materials to obtain a second synthetic lube fraction having an iodine number of less than 10.

How Norgren Oil Fog Lubrication INCREASED PROFIT 4 WAYS!



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4. Reduced lubricant expense 50%

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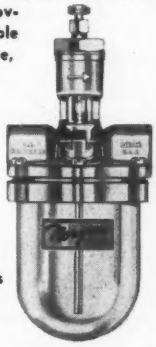

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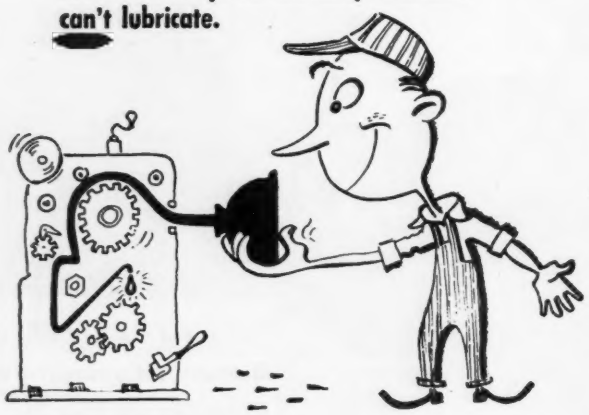

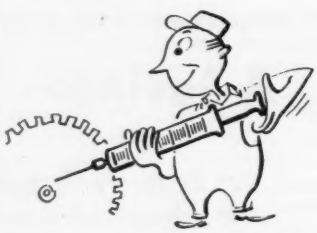

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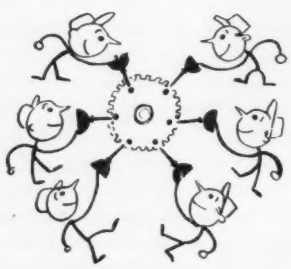

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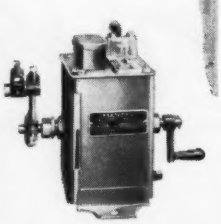

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New Products, Equipment

(*Continued from page* 225)

Hydraulic Oils Booklet: Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.—The importance of using the correct hydraulic oil to obtain higher production speeds, precise control, and longer production runs is stressed in a new 8-page booklet prepared by the above company.

Directed primarily to executives and oil buyers without a technical background, the concise descriptions of Sun's hydraulic oils and recommended applications are expected to aid in the selection of the most advantageous oil for each type of operation and plant condition.

The booklet is available free on request.

New Drum Pumps: Lincoln Engineering Co., 5743 Natural Bridge Ave., St. Louis 20, Mo.—This company announces the addition of two new heavy duty drum pumps to their line of lubricating equipment. These new 400 lb. drum size models, No. 1761 for bung-opening drums and No. 1766 for full open drums are air-motor operated. It is said they provide a fast, economical means of pumping lubricants, sealing compounds, and other semi-fluid or viscous materials directly from original 400 lb. refinery drums where abnormally low air pressures are required.

For additional information, write for Bulletin 631.

MEETINGS

Hydraulics Conference: Sherman Hotel, Chicago, Ill.—The 6th Annual National Conference on Industrial Hydraulics will be held Oct. 18-19, 1950. Twenty papers with panel discussions will cover the various phases of hydraulics with such subjects as aeronautical hydraulics — centrifugal pumps — chemical engineering — refinery hydraulics — hydraulic presses — civil engineering hydraulics — hose and fittings, and so forth. Noted authorities in their respective fields have been selected to deliver the papers.

Among A.S.L.E. members taking active part in the Conference are: C. E. Schmitz, Vice President and Director of Engineering, Crane Packing Co., Chicago and Vice President of A.S.L.E.—J. C. Van Gundy, Chemical Engineer, The Texas Co., New York and Co-Chairman of the 1951 A.S.L.E. National Program Committee—W. P. Youngclaus, Jr., Regional Manager, Alemite Div. of Stewart-Warner

Corp., Chicago, who will act as the toastmaster at the banquet to be held the evening of Oct. 18th—J. J. Slomer, Manager, Hydraulic Division, Goodman Manufacturing Co., Chicago, Assistant Director and Program Coordinator of the Conference and Chairman of the Thursday, Oct. 19th luncheon, and Chairman of the Chicago Section, A.S.L.E.—E. P. O'Sullivan, Chief Engineer Chicago Division, The Texas Co., New York, is on the Executive Committee of the Conference.

The Conference is sponsored by the Armour Research Foundation of Illinois Institute of Technology and the Graduate School of the Institute, with the cooperation of eight technical Societies; A.S.C.E., A.S.M.E., S.A.E., A.S.L.E., A.I.C.E., W.S.E., I.A.S. and A.S.A.E.

Maintenance Show: Cleveland Auditorium, Cleveland, Ohio—The second annual Plant Maintenance Show will be held January 15-18, 1951. The firm of Clapp and Poliak report that the sale of booth space is virtually completed and predict a considerable increase in size over last year.

The conference program will run concurrently with the Show for the entire four days. It will cover all phases of plant maintenance. Wednesday, January 17th, will be sponsored by the A.S.L.E. and will consist of a lubrication panel discussion, chaired by Mr. C. L. Pope of Eastman Kodak Co. and a Past President of our Society. Speakers of national reputation will take part in the discussion and the usual questions and answers will be forthcoming. The lubrication panel last year was one of the outstanding sessions of the entire conference.

Further details will be published in the December issue.

The National office has made arrangements at the Statler Hotel in Cleveland to reserve in the name of the Society a block of rooms for A.S.L.E. members during the conference. Anyone desiring a reservation, contact the National office.

N.L.G.I. Meeting: National Lubricating Grease Institute, Kansas City 2, Mo. — Announcement is made by Harry F. Bennetts, Executive Secretary, of the annual meeting of the Institute, Oct. 30, 31 and Nov. 1, 1950, at the Edgewater Beach Hotel in Chicago. A full program is scheduled, with prominent speakers covering all phases of the grease industry.

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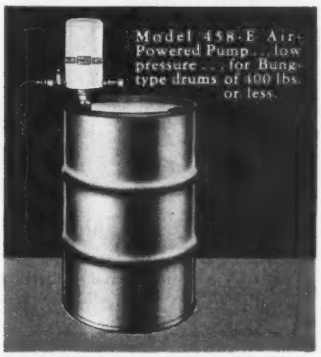
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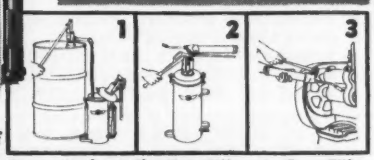

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- **MODERN, STREAMLINED DESIGN**
- **YEARS OF TROUBLE-FREE SERVICE**

FREE . . . YOURS FOR THE ASKING!

☐ "On The Job" Oiler Installation Book. ☐ TRICO Oiler Catalog.
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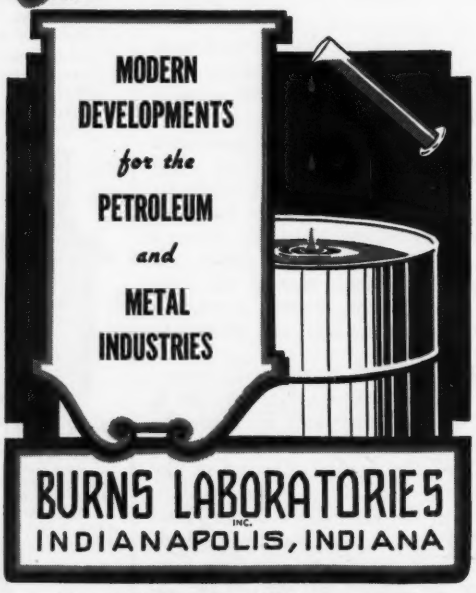
TRICO FUSE MFG. CO. Milwaukee, Wis.

SULPHUR and CHEMICAL *Additives*



BURNS LABORATORIES INC.
INDIANAPOLIS, INDIANA

Copy of this booklet available upon request.

Now—One grease will service all grease applications in the majority of plants

Gives ALL THESE PLANT SAVINGS:

1. **Extends TIME between greasings**—lasts longer . . . stays in bearings longer.
2. **Low-cost application**—fewer servicings and *only the one grease* to handle.
3. **Simple inventory**—Shell Alvania Grease replaces up to 20 brands formerly required.
4. **Better protection**—against heat, cold and moisture.
5. **Greater safety**—less chance of applying the wrong grease!

Gives ALL THESE LUBRICATION ADVANTAGES:

1. **Higher mechanical stability** than any conventional grease at operating temperatures.
2. **Pumpable at low temperatures**—even in unheated storage.
3. **Stable at high temperatures**—superior to the best "soda" greases.
4. **Impervious to water**—excellent resistance to washing out.
5. **Longer service life**—reduced consumption.

The "MILLION-STROKE" Industrial Grease!

A grease that will stand 100,000 punishing strokes of the ASTM Work Tester has been considered a superior lubricant.

In a deliberate attempt to break down Shell Alvania Grease, *on the same tester* the run was extended...200,000 strokes...300,000 strokes . . . 500,000 strokes! Finally, at one million strokes the test was discontinued, because this grease *would not break down*—it was still a fit lubricant both in appearance and consistency.

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*Denotes Residence Address Preferred.

**Note: Your editors are neutral in the dispute between Ft. Wayne and Gary for the cover title. However, until official census figures are published, we shall be guided by Ft. Wayne's Chamber of Commerce report.

OUR COVER

Under three flags—French, English and American—Fort Wayne's colorful history dates back to early Indian times. The post was established by the French towards the close of the 17th century. In 1760 it was surrendered to the English as one of the prizes at the end of the French and Indian War. The Indians regained the post in 1763. For the next 30 years the site was one of constant strife and turmoil. President George Washington sent three armies westward to drive out the Indians. Two of the armies were defeated, but the third, under General "Mad" Anthony Wayne, overwhelmed the Indians and built a wooden stockade, which became known as Fort Wayne, dedicated in October, 1794. The community that grew up around the fort was incorporated as a town in 1829 and a city in 1840.

Fort Wayne is located in the heart of the great East-North Central states. It has access to the sources of raw and semi-finished materials as well as to the major markets for finished goods. Its industry is diversified with more than 150 manufacturers. Many of the nation's largest corporations have plants within the city limits, among them, General Electric and International Harvester.

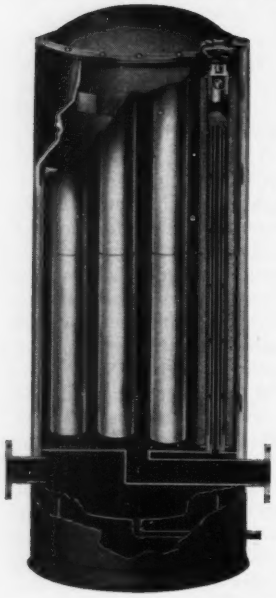
The gateway to the northern Indiana lake region, Fort Wayne is noted for its recreational and cultural activities.**

PERSONALS

Houghton Announces: E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.—Two new members were elected to the Board of Directors of the above company at a recent meeting: Mr. D. C. Miner, advertising manager, who joined the firm in 1934 and Mr. William K. Barclay, Jr., Philadelphia resident partner of Stein Bros. & Boyce. Mr. Miner is also president of the Exhibitors' Advisory Council and a director of the National Industrial Advertising Association. Mr. Barclay is past president and now a member of the Board of the Executive Committee and Finance Committee of the Philadelphia-Baltimore Stock Exchange.

(*Continued on page* 239)

HONAN-CRANE Oil Purification offers



3 types of interchangeable CARTRIDGE REFILLS

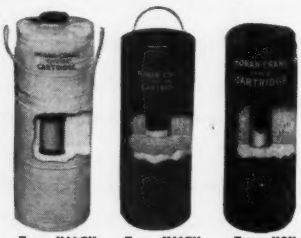
for correct handling of every purification problem

Three types of cartridge refills, designed by Honan-Crane especially for Honan-Crane purifiers, make it possible for you to select the filtering medium best suited to your purification needs. Cartridges are interchangeable and may be used to remove either solids or products of oxidation . . . maintaining any oil in approximately new condition.

Easy-to-handle Honan-Crane refill cartridges are your assurance of thorough oil purification at lowest cost.

Honan-Crane Type "M" Continuous Oil Purifier

Multiple-cartridge purifier, available in eleven sizes using 1 to 24 cartridges. Provides high flow rate and is designed to use easy-to-change "MC", "MF", or "S" type cartridges.



Type "MC" Type "MF" Type "S"

Honan-Crane Type "MC" Cartridge

"MC" Cartridge is a woven cotton bag containing 15 pounds of Cranite (specially processed fullers earth). Solids and abrasives as well as soluble products of oxidation such as asphaltenes, resins and acids are removed from the oil.

Honan-Crane Type "MF" Cartridge

"MF" Cartridge is a perforated metal basket lined with a woven cotton sock material and uniformly packed with Palconia (specially selected cellulose fiber filtering medium). Complete removal of solids such as abrasives, scale and other foreign matter.

Honan-Crane Type "S" Cartridge

Type "S" Cartridge contains 4½ pounds of Palconia tightly packed in a specially woven cotton sock material. Performance of the cartridge is comparable to the "MF" cartridge in removal of abrasives, scale and other foreign solids.

Write for descriptive bulletins covering Honan-Crane Oil Purification Equipment for Diesel Lube and Fuel Oils, Turbine Oils, Cutting Oils, Quench Oils, Coolants, etc. State type of purification problem.

HONAN-CRANE CORPORATION

202 INDIANAPOLIS AVE., LEBANON, INDIANA

A Subsidiary of **HOUDAILLE-HERSHEY CORP.**

Organized Lubrication in a Manufacturing Plant

(*Continued from page* 207)

experience, skill, and that they have a stake in the trade which cannot be ignored without risk. So the wise lubrication engineer will take advantage of all the possibilities inhering in the reputable purveyors; and, so, will be able to formulate really effective specifications.

Specification Safeguards

The lubrication engineer will, if he decides that the best interests of his company dictate the writing of specifications, remember that almost all specifications are written around proven trade brands. He will ask the collaboration of the sales engineers of the suppliers, in the writing of his specifications. And he will avoid the pitfalls of writing specs with inadequate quality safeguards as he would avoid the devil. Until he is sure he is possessed of the detailed knowledge of what constitutes these quality requirements, and has available the testing machinery to evaluate quality, he will adhere rigidly to performance specs, backed by carefully supervised and recorded service tests; and he will stay away from physical-chemical lab type specs.

Trouble Shooting

When, in spite of the most careful approach and the utilization of the best knowledge available, chronic trouble results, or spasmodic trouble breaks out, the lubrication engineer, the lubrication service crew, and the shop lubrication committee must get together and study the nature of the trouble and the circumstances surrounding its occurrence; so as to disclose all the related conditions, and build up the basis for better judgment, based on just this sort of experience, that will provide means for mitigating the trouble and building up better practice to eliminate recurrence of the trouble. Or else, to accumulate overwhelming evidence as to where, how, and why the troublesome equipment is inadequate; and then to rectify it or replace it.

Records Invaluable

This is where the machine records are invaluable and provide the basis for constantly improved choice of equipment; and just as continually improving lubrication practices.

Earmarks

Such studies indicate that organized lubrication is dynamic. That it is a force for progress. That only by its exercise can preventative maintenance be accomplished.

In Union, There is Strength

And that, above all, it is a cooperative venture; which, by a union of interests, provides a maximum of benefit.

Result

So here we have the means of "getting the grease monkey out of the grease."

Personals

(*Continued from page* 237)

New Sales Manager: The Cleveland Worm and Gear Co., 3250 E. 80th St., Cleveland 4, Ohio. — The appointment of Mr. Lee O. Witzenburg as General Sales Manager of the above company and its subsidiary, The Farval Corp., has been announced by Mr. Howard Dingle, President.

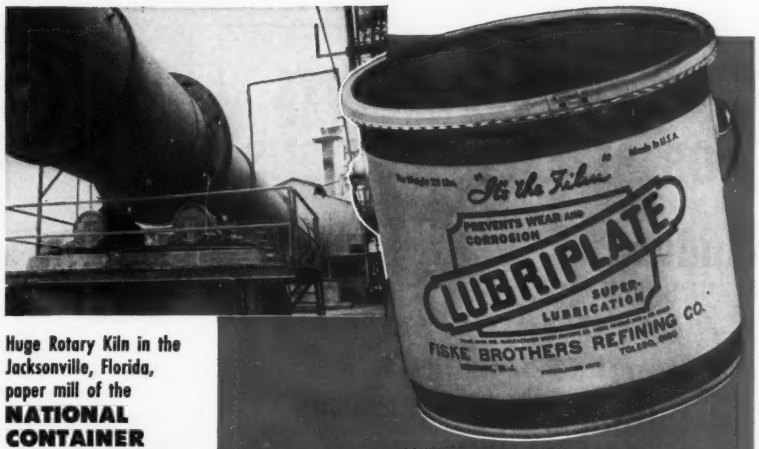
Mr. Witzenburg is a graduate of the University of Nebraska, with degrees in electrical engineering and business administration. He brings to his new position a broad experience in the field of power transmission, having been sales manager of the V-belt Division of the Gates Rubber Co., and more recently sales manager of the Tann Corp., Detroit.

Milton A. Dewey: Canadian Industries, Ltd., Toronto, Ont., Canada —E. I. Du Pont de Nemours & Co. announce the resignation of Mr. Dewey, who has served with them for 13 years in petroleum chemicals, research and sales. Canadian Industries, Ltd. is one of the Dominion's foremost chemical manufacturing distributing concerns. A new department has been created, headed up by Mr. Dewey for the Canadian sales of Du Pont tetraethyl lead antiknock compounds and the company's other petroleum additives.

Mr. Ray E. Miller, Director of Petroleum Chemicals Sales for Du Pont said the move was being made "to better serve the Canadian oil industry with the company's chemical additives for gasoline and lubricating oils."

Mr. Dewey is a member of A.S.L.E. and Co-Chairman of the 1951 National Program Committee. His new connection will serve to enhance the prestige of A.S.L.E. across the border.

George W. Semler: United Oil Co., Pittsburgh 33, Pa. — Mr. Semler, Secy.-Treas. of the Pittsburgh Section, A.S.L.E., has been appointed sales manager for the above company. He was formerly connected with the Esso Standard Oil Co. Mr. Semler is active in A.S.L.E. and all of his friends wish him well in his new affiliation.



Huge Rotary Kiln in the Jacksonville, Florida, paper mill of the **NATIONAL CONTAINER CORPORATION**

they say:

"We use This Lubricant on big, hot, heavy bearings, too!"

Following is an extract from a lubrication report made by the plant engineer at the Jacksonville, Florida, Plant.

7' diameter by 300' long lime kiln, supported by five sets of trunnion rollers.

Temperature inside kiln at hot end is approximately 1800° F.

Kiln turns at approximately 1 RPM, trunnions turn at approximately 3 RPM on 7" journals in sleeve bearings lubricated by LUBRIPLATE No. 8.

Since changing to LUBRIPLATE No. 8 two years ago, wear on all bearings and journals has been reduced to a minimum, where formerly a definite problem of lubrication existed.

It is in these unusually severe applications where LUBRIPLATE Lubricants dramatically prove their outstanding qualities. Probably more seemingly impossible lubrication conditions have been satisfactorily met with LUBRIPLATE in the past twenty years than by any other group of lubricants.

In most instances, LUBRIPLATE Lubricants have been introduced to solve a difficult lubrication problem. Their performance is so remarkable that their use is extended throughout the plant. They definitely reduce friction and wear, prevent rust and corrosion and save power.

LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases . . . a product for every lubrication requirement. Let us send you case histories of their use and savings in your industry. Write today.

LUBRIPLATE DIVISION
Fiske Brothers Refining Company
Newark 5, N. J. Toledo 5, Ohio

DEALERS EVERYWHERE—CONSULT YOUR CLASSIFIED TELEPHONE BOOK

LUBRIPLATE THE MODERN LUBRICANT

TESTED LUBRICANTS FOR ALL APPLICATIONS

Industrial -- Automotive

STEAM ENGINES
DIESEL ENGINES
TURBINES • COMPRESSORS
METAL WORKING
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AUTOMOTIVE EQUIPMENT

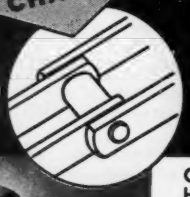
SINCLAIR

SINCLAIR REFINING COMPANY

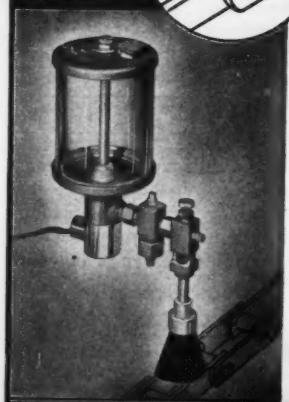
630 FIFTH AVENUE • NEW YORK 20, N. Y.

PROTECT CONVEYOR CHAINS

Keep lubricating film between pin and bushing



ACCURATE AUTOMATIC LUBRICATION



Oil working into pins and bushings lengthens chain life and avoids excessive wear. Oil-Rite Chain Oiler feeds lubricant by gravity from reservoir through a solenoid operated valve and a sight feed valve to a brush which rides the chain.

- Avoids excess lubricant
- Keeps floors clean
- Saves labor
- Low cost

FOR ANY LUBRICATION PROBLEM . . . ask for our engineering suggestions

OIL-RITE CHAIN OILER

OIL-RITE CORPORATION
3428 S. 13th St.
MILWAUKEE 15, WIS.

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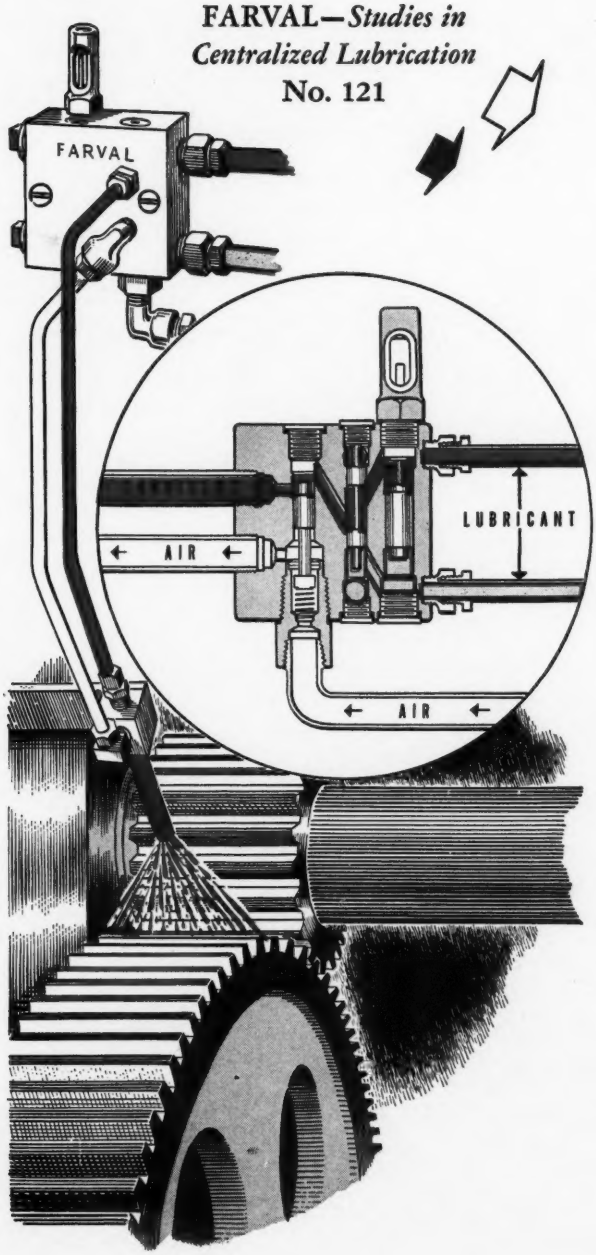
FARVAL—*Studies in Centralized Lubrication* No. 121

New Farval Spray Valve

meters lubricants to slide surfaces and open gearing



CONTROLLED spraying of lubricant on open gearing, slide surfaces, etc., is practical with the new Farval Spray Valve.

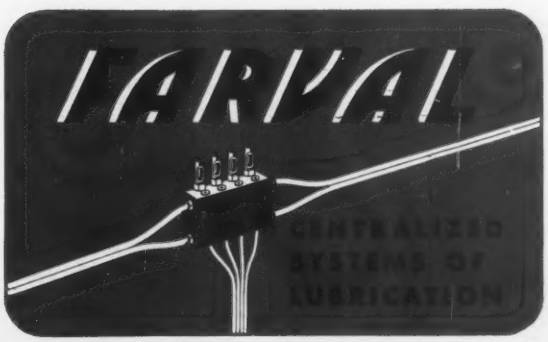
By an ingenious adaptation of the familiar Farval Dualine Valve, either grease or oil is sprayed through a nozzle—on any desired area, in any desired amount, and at any desired interval. The new spray valve can be added at any point in a regular Farval Dualine System where compressed air is available—or a complete system may consist entirely of spray valves, served by either manual or automatic pumping unit.

Compressed air from the supply line is directed through the spray valve, which meters air to the delivery nozzle just as lubricant is metered. By a unique arrangement, the lubricant valve also turns on and shuts off the air. Thus the quantity of air used is limited to the amount needed to spray each delivery of oil or grease, without exhausting or reducing pressure. Positive cut-off of lubricant by the Farval valve after each delivery eliminates bleeding from the nozzle—no waste, no mess, no trouble.

The Farval Spray Valve has been thoroughly tested in service and is now in use on a wide variety of machines and equipment. It has demonstrated its ability to supply lubricant efficiently and economically to open gearing, slide surfaces, in fact, wherever a standard Farval Dualine closed system is not readily adaptable.

Write for a copy of Farval Spray Valve Bulletin No. 60 for a full description, with illustrative diagrams and installation data. The Farval Corporation, 3267 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



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